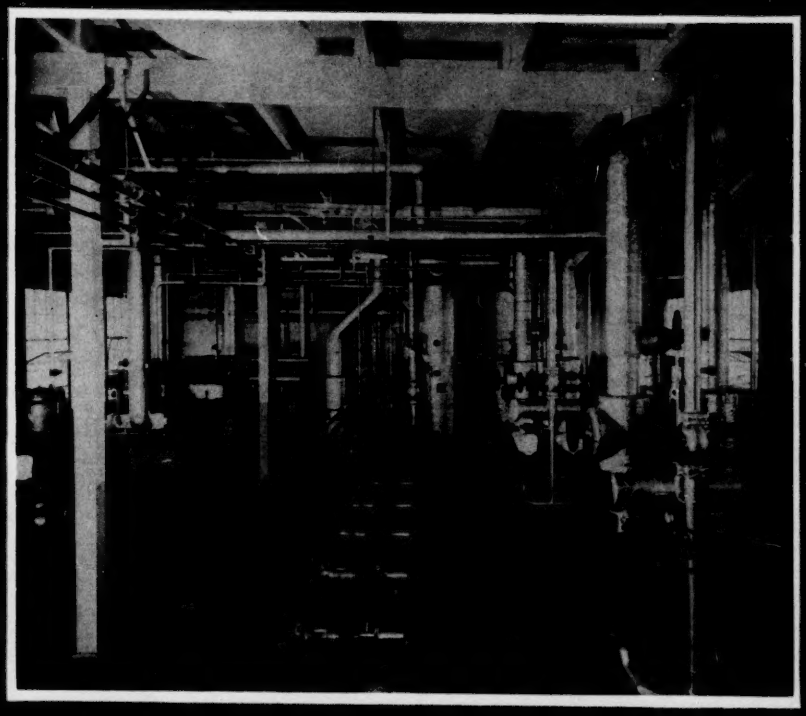
ICE and REFRIGERATION

THE
INDUSTR



How Fluctuating Temperatures Affect Quality .... Page 13

AUGUST • 1951

Annual Report on Sales of Ice During 1950 .... Page 21

Announcing

THE NEW AND IMPROVED

TEXACO CAPELLA OIL

(WAXFREE)

Assures clean compressor operation even at temperatures below –100° F.

Here's an oil that gives clean, efficient, low-cost compressor operation at temperatures below –100° F. It's the new and improved *Texaco Capella Oil (Waxfree).*

Tests show *Texaco Capella Oil (Waxfree)* exceeds competitive refrigerator oils for low haze and floc temperatures . . . assures freedom from wax precipitation and from foaming. In addition, *Texaco Capella Oil (Waxfree)* has a very low pour test, purity, oxidation resistance and freedom from moisture.

Whatever the size or type of compressor . . . whatever the conditions of operation, and regardless of temperature . . . there is a *Texaco Capella Oil (Waxfree)* to assure maximum performance at the minimum expense. Cleaner, smoother, more trouble-free operation – with a worthwhile reduction in maintenance costs. Available in specially sealed 55-gal. drums, 5-gal., 1-gal. and 1-qt. cans.

A Texaco Lubrication Engineer will gladly advise you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

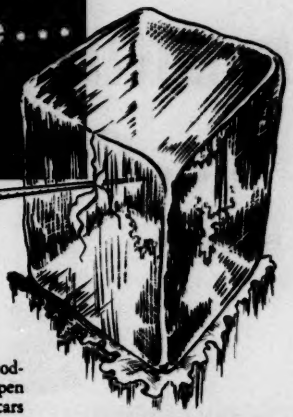
The Texas Company, 135 E. 42nd St., N. Y. 17, N. Y.

TEXACO Capella Oils (Waxfree)

FOR ALL AIR CONDITIONING AND REFRIGERATING COMPRESSORS

improve your crushed ice service . . .

AND SELL MORE ICE

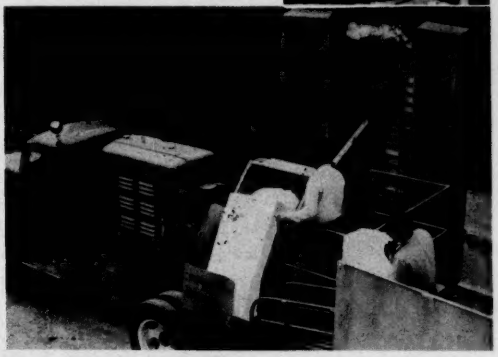


Open New Sources of Profit
In the Perishable Food Field

Equip your plant to offer crushed ice service to shippers of perishable products. Conveyco ice crushers, crusher-blowers and portable crusher-blowers open new opportunities for selling more ice. Top icing trucks and railroad cars loaded with produce and other perishables is profitable business. If you're not located near a truck depot or railroad siding, Conveyco's portable truck-mounted crusher-blower will permit you to offer crushed ice service at the customer's location. Vegetable markets, milk trucks, shippers of fruits and vegetables, plus many other local customers need crushed ice to protect their merchandise. Take advantage of this lucrative market now with profit-making Conveyco ice crushing and ice conveying equipment.

You can get complete information by filling in the coupon below and mailing today! Get in on these extra profits now!

Icing carloads of produce offers extra profits. Reefer trucks also present an additional market for ice.



Truck mounted Crusher-Blower icing a car.

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Please send complete details on Ice Crushing and Conveying Equipment.

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Company _____ Address _____

City _____ State _____

DISTRIBUTION BROADENED ... QUALITY PROTECTED for SUNISO® REFRIGERATION OILS

Only in Refinery-Filled & Refinery-Sealed Containers

From now on, refrigeration and air-conditioning supply houses and service organizations will be supplied genuine Suniso Refrigeration Oils *only in packages filled and sealed at the Sun Oil Company refineries.* Sun has established this policy in order to make absolutely certain that the trade receives Suniso Refrigeration Oils with all their superior characteristics unimpaired.

The Suniso Trade-Mark Is Your Protection

The presence of the registered Suniso trade-mark on the container is your assurance that you are getting genuine Suniso Refrigeration Oil. The Suniso name on the can or drum is your guarantee of long life-stability, non-waxing characteristics, high dielectric strength, low pour point, and precisely maintained viscosity.

New Distributor for Refrigeration Supply Houses

VIRGINIA SMELTING COMPANY has been added to the sources from which wholesalers and supply houses can get genuine Suniso Refrigeration Oils. This means many new distribution points from which Suniso can be obtained in the United States, Canada and throughout the world.

Special Significance to Manufacturers

Leading manufacturers of refrigeration and air-conditioning equipment charge their new compressors with Suniso. The addition of VIRGINIA SMELTING COMPANY as a Suniso distributor assures these manufacturers of adequate supplies of Suniso in the hands of service organizations everywhere. This means manufacturers' equipment can be properly serviced with the specified grades of Suniso. Equipment failures caused by inadequate oils can be avoided.

WRITE NOW FOR PARTICULARS

If you're interested in more information about Suniso Refrigeration Oils, write to Dept. IR-8, Sun Oil Company, Philadelphia 3, Pa.

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SUNOCO®

ICE and Refrigeration

VOLUME 121 NUMBER 2

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August 1951

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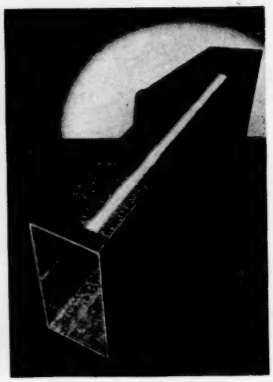
KNICKERBOCKER PRODUCTS ON DISPLAY



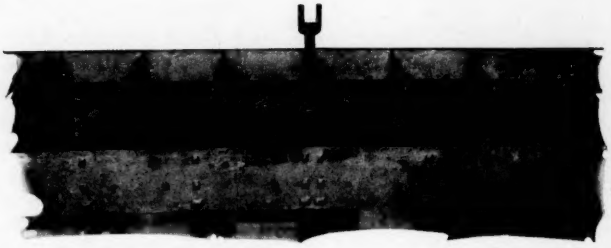
ICE CANS

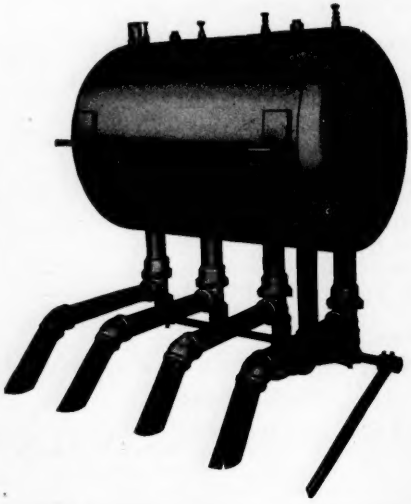
WELDED OR RIVETED
IF IT IS AN ICE CAN
KNICKERBOCKER CAN CAN MAKE IT!

ANY SIZE — ANY STYLE
HIGH PRESSURE LOW PRESSURE
ARCTIC PAWNALL
ULINE BOTTOM

CAN GRIDS

VARIOUS—
DESIGNS
STYLES
WEIGHTS





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For one or more cans.
Will not Leak.
Accurate measurement each filling.

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At Your Service — Representatives Everywhere

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Parkersburg, W. Va.

76% of your CUSTOMERS want ICE CUBES in this type BAG*

*

"ICE & REFRIGERATION" SURVEY PROVES CUSTOMERS PREFER WET STRENGTH ICE BAGS.

Of 3937 mechanical refrigerator owners asked, 2992 chose wet strength paper bags as the most practical ice cube package. Deliver your cubes in the best . . . International Hydrotuf.* They're easy to carry, neat to use, and they keep ice longer.

International ice bags save your time too—store flat, fill easily and seal tight with a twist. Build new business this summer with the ice bag that's away ahead in convenience and popularity.

KEEP YOUR PRODUCT AND SERVICE SOLD.

The bag you use for ice cubes is part and parcel of your service when signed with your name and advertising message. Make sure it's an International bag.

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INTERNATIONAL PAPER COMPANY
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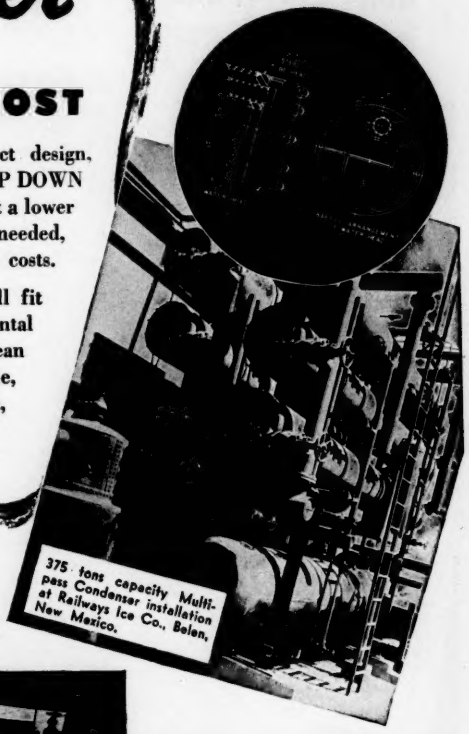
$ave Power and REFRIGERATION COST

Vogt Condensers, because of their correct design, STEP UP the rate of heat transfer and STEP DOWN head pressures. With the liquid delivered at a lower temperature, smaller compressor capacity is needed, saving in original as well as operating costs.

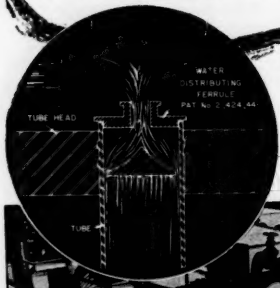
One of the two basic types illustrated will fit your operations exactly. Install Horizontal Multipass (closed type) for use with clean waters. Where the water is hard, forms scale, contains mud or promotes fungus growth, Vertical Single Pass (film type) which can be cleaned in operation, are recommended.

Horizontal Multipass Condensers
(Closed Type)

Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.

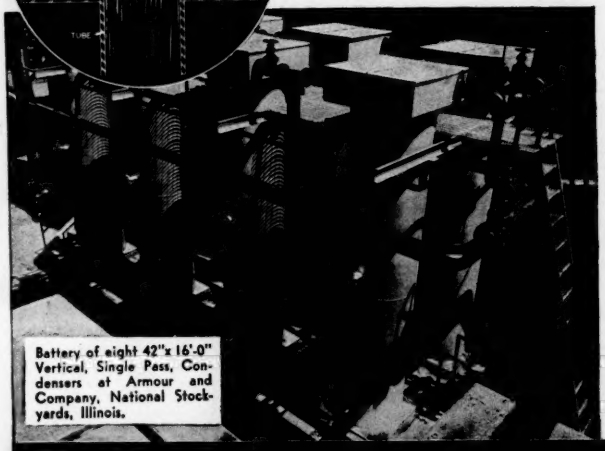


375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.



Vertical Single Pass Condensers
(Film Type)

Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.



Battery of eight 42"x 16'-0" Vertical, Single Pass, Condensers at Armour and Company, National Stockyards, Illinois.

HORIZONTAL and VERTICAL TYPES SHELL and TUBE CONDENSERS For Every Service

Write For Bulletin RC-1

HENRY VOGT MACHINE COMPANY
INCORPORATED
1000 W. ORMSBY ST., LOUISVILLE 10, KY., U.S.A.
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Vogt REFRIGERATION CONDENSERS

INSTALLATION FILE NO. 1016

Better tank protection – new technique with PALCO INSULATION WOOL

FAMOUS ALFORD WAREHOUSES INTRODUCE NEW METHOD IN BRINE TANK INSULATION

PROBLEM:

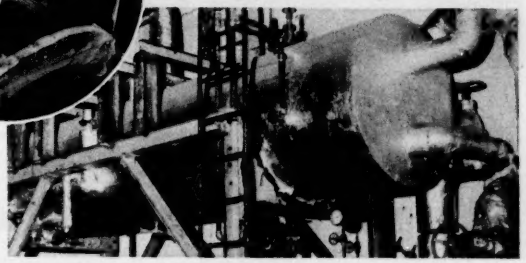
Rupture of vapor-seal caused failure of conventional blanket type tank insulation. Usual trouble starts with slight breaks in vapor seal caused by accidental dropping of tools or other minor blows or pressures. Moisture drawn into breaks freezes, expands to enlarge the rupture, and rapidly destroys insulation.

Above: Rigid wooden retainer surrounds brine tanks which are 18' long, 34" in diameter.

SOLUTION:

Engineers for Alford Refrigerated Warehouses, world's largest cold storage plant, solved the problem. A simple rigid wooden jacket surrounding each tank is filled with a 6-inch thickness of non-settling Palco Wool Shredded Redwood Bark Fibre*, which offers much higher insulating efficiency than original materials. The jacket is of tongue and groove sheathing supported by circular wooden spacers surrounding the tank. Exterior is vapor-sealed with two coats of asphalt base plastic cement, a layer of cheesecloth, another layer of plastic cement, followed by a coat of aluminum paint.

Left: 6" thickness of resilient Palco Wool Insulation is hand packed as T&G retainer is built up. Note spacers surrounding tank.



Above: As work nears completion, note clean appearance of new insulated jacket topped off with rupture-proof vapor-seal.

RESULT:

Virtually rupture-proof vapor seal, with permanently increased insulating efficiency.

*Alford engineers know the advantages of Palco Wool, since the entire plant is insulated with Redwood Bark Fibre, which has a thermal conductivity of only .255 B.t.u.

NATURE'S INSULATION · FROM AGE-OLD REDWOOD BARK · FLAMEPROOFED

Mail attached coupon today for more detailed information.

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☐ PALCO WOOL COLD STORAGE MANUAL
☐ FREEZER PLANT PLAN AND CONSTRUCTION MANUAL

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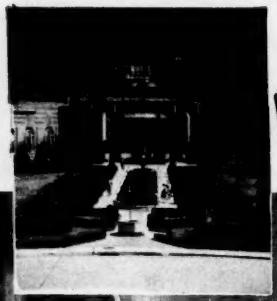
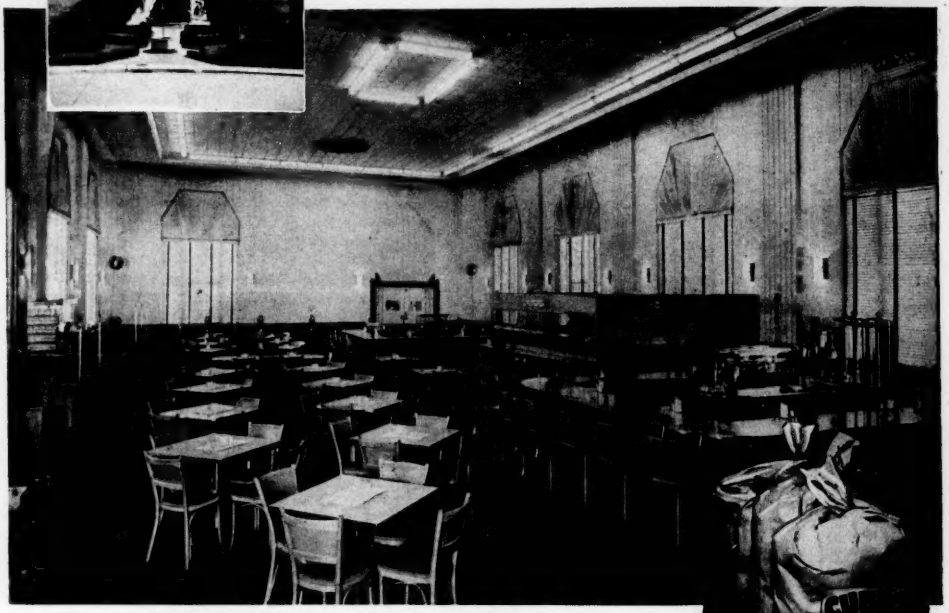
Title_____
Company_____
Street_____
City_____ Zone____ State_____
IR-8



"We take no chances with dirt. We insist on Packaged Processed Ice"

SAYS LESTER J. QUINN, FAIRFAX AIRPORT RESTAURANT, KANSAS CITY, KAN.



The Fairfax Airport Restaurant occupies one wing of the beautiful airport building of Kansas City's Municipal Airport.

Don't Let Another Month Pass Without Using One-Trip Ice Bags

"Formerly, we had ice delivered in bushel baskets, but it was too often dirty when we received it," reports Mr. Quinn. "Now we insist on Union Paper Ice Bags. Our ice is clean and the bags retard melting so satisfactorily that ice delivered on Saturday will carry over for Sunday."

Union Paper Ice Bags help your own operation, too. Your service is faster because handling time on the platform, in loading and at delivery point is cut down. Customers do their own icing and use more ice.

Yes, the companies using Union Paper Ice Bags get the cream of the business according to reports clear across the country. If you haven't already asked for samples of the one-trip Union Paper Ice Bag, don't delay. Write for free samples now.

Wet-Strength Paper Ice Bags have tremendous strength even when soaking wet... thanks to a water repellent resin that binds the fibres of the paper firmly together.

ONE TRIP

UNION Paper Ice Bags

A product of the UNION BAG & PAPER CORPORATION • Woolworth Bldg. New York 7, N.Y.

Bags of Kraft, Transparent Films, Waxed Paper, Glassine, Laminates

ARE YOU ON A MAINTENANCE MERRY-GO-ROUND?

Every year, the United States spends the fantastic sum of *over eight billion dollars* just on maintenance of its industrial plant—sad proof that too many companies are on a "maintenance merry-go-round"!

Needless to say, this huge expenditure cuts deeply into profits . . . makes it imperative for you to examine *your* maintenance costs—find ways to keep them as low as possible.

One proved way to do this is to see that all your machines get *Correct Lubrication*. This means far more than just "oils and greases." It means an analysis of your plant, recommendations of the right lubricants, guidance on when and how to use them.

Socony-Vacuum, with 85 years of experience, provides this combination of knowledge and product in one completely integrated lubrication program, tailored for your individual plant.

Why not start such a program now . . . and start cutting *your* maintenance costs?

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Lubricants

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WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

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used for years
in ice plants
all over the world

templets

The little green tablets that make ice clearer!

For over twenty years, thousands of ice plants in the United States and in many foreign countries have been tempering raw water ice with B-P TEMPLETS.

TEMPLETS give you a stronger ice cake that does not readily crack, break or chip. Because TEMPLET-treated ice is stronger, you can freeze it faster with lower brine temperatures, make more ice in the same cans.

TEMPLETS give you a clearer ice cake. They completely or partially eliminate the white butts, heavy cores and cloudy veils that customers don't like.

the templet treatment

costs only about 1¢ a ton!

Two or three green TEMPLETS in every can are all you need. They dissolve readily, and leave no taste, odor or color. Your customers want ice with a clean attractive sparkle and polish—TEMPLETS help you make it for them, at a cost of only 1¢ a ton!

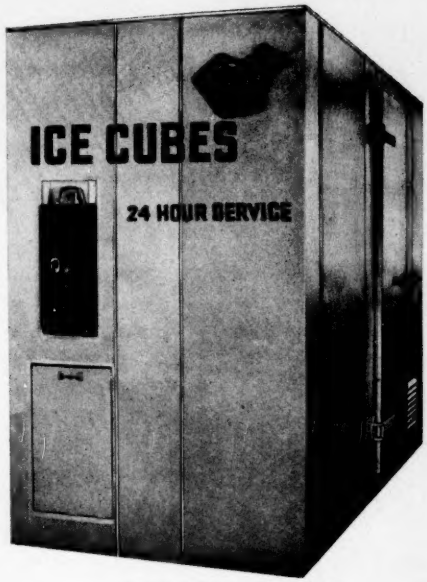
GET ON THE BANDWAGON WITH THE THOUSANDS OF OTHER USERS OF B-P TEMPLETS

SEND TODAY FOR YOUR FREE SAMPLE

BARADA & PAGE, inc.

GUINOTTE and MICHIGAN AVES.
KANSAS CITY, MISSOURI

The NEW POLAR CUBED and CRUSHED ICE VENDING STATION



Patented—Design Patent Applied For

Belt Capacity— 50 ten-pound bags
Storage for 200 ten-pound bags
PRICE: LESS THAN $1500.00

POLAR PRODUCTS ARE BUILT OF THE FINEST MATERIALS BOTH *EXTERNALLY* AND *INTERNALLY*.

Check these POLAR features:

1. Completely covered with embossed aluminum.
2. Armstrong fibreglas insulation.
3. Aluminum foil vapor seal paper.
4. Automatic electric defrost.

ALL of these special POLAR features are included in the new Premium ice vending units.

1. Gives maximum utilization of refrigerated space. Ice can be bagged in station.
2. Fits in a small space, easily placed. Cabinet is 8'-10" long, 6'-6" high, 46" wide. Specially suited for heavily populated downtown locations.
3. Shipped ready to operate—just plug in. Equipped with front light and time clock.
4. Beautiful in appearance. Identical material as used in regular POLAR line.
5. One piece aluminum weatherproof roof.

For further information and descriptive literature-- write

REFRIGERATION ENGINEERING COMPANY
Montgomery, Minnesota

In The Spotlight

THE EFFECT of fluctuating temperatures on the storage life and quality of frozen foods has been a subject of considerable controversy. A study on this subject conducted at the College Park (Md.) Fishery Technological Laboratory, shows that fluctuating temperatures, contrary to the usual opinion, in themselves do not have an adverse effect on the quality of frozen fish fillets. A report on the study starts on page 13.

COURT DECISIONS may help readers to avoid expensive law suits, although some of them may reverse older law. Reviews of cases carried to higher courts involving ice companies but of interest to other lines also are presented in the article starting on page 17.

ICE SALES for 1950 amounted to 33,897,798 tons. While this was less than 1949 sales, it was 12 percent more than the 1940 sales. Processed ice with less decreases show an encouraging tendency to hold their own in all sections of the country. Detailed figures and comment on this annual survey of the National Association of Ice Industries are given in the article on page 21.

REVISED CONTROL of ice prices from Washington is still uncertain, but it is hoped that plans may be devised to relieve many of the industry's pricing ills. For comment on the situation as viewed by the National Association of Ice Industries, see page 23.

A NEW ONE-FLOOR freezer storage is being erected on the southwest side of Chicago, scheduled for operation by November 1. Of modern design, it will provide facilities for rapid and efficient handling of freezer commodities. For preliminary details see page 47.

COVER PICTURE: Compressors in Modesto Refrigerating Plant, Modesto Calif. These ammonia compressors have a rating of 800 tons and 200 tons booster capacity. They were added to accommodate additional storage rooms.

SAFETY WORK in the ice industry is especially important with the coming of hot weather when the annual peak of production and sales is reached, requiring new and untrained workers. How this situation is met by a middle-western ice distributor is told in the article starting on page 27.

SAFETY PROTECTION for Refrigerating Equipment — A complete directive for promoting safety in refrigerating equipment. Much background material is given from extensive experience in this important field. See page 32.

WHAT'S WRONG with the refrigerated warehousing industry is told by a refrigerated warehouseman who tells how their frozen food storage service is inadequate and tells what should be done about it. See page 43.

SELLING ICE as people like it is another vending machine article—telling how the Citizens Ice & Fuel Co., St. Paul, Minn. installed ice vending machines to replace lost domestic tonnage. See page 25.

CORRECT TEMPERATURES for frozen foods are important in all stages from the processing plant to the consumer. The article on page 52 by a frozen food packer presents documented information on the best known temperatures for processing, storing and distribution.

60 Years Ago

From the July and August 1891 Issues of ICE AND REFRIGERATION

THE FIRST issue of ICE AND REFRIGERATION appeared July 1. 1891, the first periodical devoted to the interests of the refrigerating industries. In an introductory statement the publishers promise that the high standard of excellence of this first issue will in no particular be allowed to deteriorate. After sixty years the present publishers feel sure that that promise has been faithfully fulfilled.

THE SOUTHERN ICE EXCHANGE was organized at a meeting held at Chattanooga, Tenn., February 12, 1890, sponsored by L. S. Young, Gadsden, Ala., and Chas. W. Biese, Chattanooga, Tenn. Wm. J. Rushton, Birmingham, Ala., was elected president and Mr. Biese vice-president.

ICE MAKING is described in a series of articles by Charles W. Biese, Chattanooga, Tenn., one of the pioneer refrigeration machinery manufacturers. These articles have provided valuable information on the history of ice-making. Mr. Biese says it is safe to estimate the cost of ice machines f.o.b. factory at about $1500.00 per ton. Daily wages varied from $2.50 to $3.00 for engineers, $1.20 to $1.50 for firemen and $1.00 to $1.25 for ice pullers.

AN "ICE FACTORY" of the Atlantic Ice Co., Atlanta, Ga. organized in 1887 was increased from daily capacity of 20 to 60 tons daily. The machinery was supplied by the Arctic Ice Machine Co. of Cleveland and John Featherstone's Sons, Chicago.

A NEW COLD STORAGE warehouse was completed by the Philadelphia Warehouse & Cold Storage Co. It was "an imposing structure of massive design, eight stories in height, having a frontage of 125 feet, a depth of 150 feet and a height of 120 feet.

THE TEXAS Ice Manufacturers Association was formally organized with R. E. Maddox, Ft. Worth, as president and C. W. Dawley, Denison as vice president. The association dropped a project to erect their own ammonia manufacturing plant.

ADVERTISERS in the first issue of ICE AND REFRIGERATION who have continued their advertising since then were: Gifford Bros. (now Gifford Wood Co.), Weisel & Vilter Mfg. Co. (now Vilter Mfg. Co.), and Frick Co.

...is one way to bigger profits

Expensive "muscle power" in an ice plant is a continuous drain on profits as well as a man's constitution. It needn't be. Because a G-W slat conveyor is a big labor saver... moves bagged and cake ice around the plant or to delivery platforms in less time and with fewer broken cakes. That adds up to lower over-head—more sales—bigger profits.

G-W conveyors are designed to carry block or processed ice in bags on straight, curved or right angle sections, from room to room or the outside platform. Unlimited flexibility assures an arrangement to fit perfectly your plant layout.

A Gifford-Wood engineer will be glad to visit your plant upon request. He is ready to apply 135 years of ice handling experience to any problem you may have without obligation. Call him in—let him show you the G-W way to bigger profits.

GIFFORD-WOOD CO.

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FLUCTUATING TEMPERATURES

Detailed study shows extent to which fluctuating temperatures affect quality of frozen fish in storage. Results show average temperatures probably more important.

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IN MANY articles dealing with the storage of frozen foods, considerable emphasis has been placed on the need for keeping foods at a constant storage temperature at all times. That such a condition is very difficult and often impossible to satisfy is quite obvious when some of the problems connected with the maintenance of constant temperatures are considered. Some of the causes of fluctuations are: using storage rooms for freezing; overloading of the refrigeration equipment; power failure; equipment breakdowns; improper setting of control devices; transferring frozen products from one storage room to another; and transporting frozen products from producer to consumer. Considering the number of opportunities for the temperature to change, it is quite possible that some products may undergo a series of fluctuations in temperature before reaching the ultimate consumer.

Very little definite information or actual data can be found in support of the much-repeated statement that fluctuating temperatures harm the quality of frozen foods. In many cases, the statement is undoubtedly based on hearsay and has been passed along for many years. Very often, the statement is based on a theoretical estimation of the effect of temperature changes on the increase and decrease in vapor pressure and its effect on the water transfer in the stored product. This would supposedly affect the rate of desiccation and size of ice crystals.

Because of the need for information of this type for fish, a study of the effect of fluctuating storage temperatures on the quality of fish was initiated at the College Park (Maryland) Fishery Technological Laboratory of the U. S. Fish and Wildlife Service.

Very little definite information or actual data can be found in support of the much-repeated statement that fluctuating temperatures harm the quality of frozen foods. Because of the need for this type of information for fish, a study of the effect of fluctuating storage temperatures on fish quality was initiated at the College Park (Md.) Fishery Technological Laboratory of the United States Fish and Wildlife Service. Results of this investigation show no adverse effect on the quality of frozen fish fillets due to fluctuating storage temperatures in the temperature ranges covered in these experiments. The average storage temperature encountered during the fluctuations would seem more likely to be the deciding factor.

Preparation of Samples

Two varieties of fish were used in the tests. Striped bass or rockfish *(Roccus saxatilis)* was chosen as being representative of a non-fatty type of fish. Since the fat in fish is very susceptible to oxidation and often undergoes rapid changes during frozen storage, a fatty type of fish was included and was represented by Boston mackerel *(Scomber scombrus)*. The striped bass were obtained from a nearby packing house and had been out of the water less than one-half day when brought to the laboratory. The Boston mackerel were taken directly from the boat in Boston and shipped immediately by railway express, and the shipment arrived at the College Park laboratory on the following day. Both varieties of fish were filleted upon arrival at the laboratory. The fillets were washed thoroughly in tap water and allowed to drain. They were then placed in a chilled room with a temperature of 35 F. Wrapping of the fillets was started as soon as possible, and only a few fillets were taken from the chilled room at a time.

Fillets of each variety of fish taken at random were wrapped in pairs in moisture-vaporproof cellophane. They were weighed before and after wrapping. A tightly applied druggist's wrap was used on half of each lot of fillets. The other half of each lot was wrapped so as to permit large air spaces to remain in the packages in order to determine whether fluctuations in temperature caused increased moisture loss and cavity ice or frost formation within the package. All packages were immediately placed individually on freezer plates in a room at a temperature of – 15° F. and held there for approximately two days.

An equal number of packages of both varieties of fish, in tight and loose wraps, were placed in storage at the following temperatures: – 10 F; 0 F; fluctuating between 0 and – 10 F; 15 F; and fluctuating between 0 and 15 F. As planned originally, fluctuations in temperature were to occur every four days by moving the fillets from the one temperature to the other. After the first month of storage, it was apparent that the mackerel would have a relatively short storage life. Therefore, it was decided to subject various mackerel samples to additional fluctuations in temperature in order not to discard a large number of unused samples because of poor quality; consequently, fluctuations at three-day and one-day intervals were also maintained as far as possible. But the striped bass fillets were subjected to the four-day cycle only.

A sufficient number of packages were prepared to make the required number of examinations at monthly intervals. Over the entire storage life of the products, two and, in a number of cases, three examinations each on different packages were made.

Examination of Samples

At monthly intervals, two separate packages each of striped bass and mackerel (in a number of instances three separate packages of mackerel) fillets were removed from storage and weighed before and after removing hte wrapper. Each package contained two complete fillets. After noting the condition of the frozen fillets, portions from each fillet were taken for palatability tests, determination

TABLE I—AVERAGE OF TWO PALATABILITY SCORES FOR TIGHTLY-WRAPPED AND LOOSELY-WRAPPED PACKAGES OF STRIPED BASS FILLETS STORED AT VARIOUS TEMPERATURES

Storage Temperature	Type of Wrap	Palatability Score[1] —Storage Period in Months 1	2	3	4	5	6	7	8	9	10
—10 F.	Tight	99	100	98	90	91	89	90	88	88	82
	Loose	98	100	95	88	84	86	81	82	81	72
Fluctuating between —10 F and 0 F. at four-day intervals	Tight	98	100	97	89	90	89	89	88	88	83
	Loose	95	100	95	89	87	87	83	83	80	72
0 F.	Tight	99	100	98	87	89	87	87	87	84	82
	Loose	98	100	97	86	84	85	78	82	75	75
Fluctuating between 15 F. and 0 F. at four-day intervals	Tight	99	100	97	87	83	81	76	74	74	...
	Loose	98	100	96	79	81	80	80	80	.....	
15 F.	Tight	100	100	94	84	81	81	72	71	69	...
	Loose	95	99	95	77	77	77	77	71	.....	

[1] The palatability score was calculated as follows: The fillet was scored on the basis of 1 to 10 points each for appearance, flavor, and texture. The flavor score was doubled in order to give additional weight to this factor. The mean as a percent of these scores resulted in the palatability score. A sample with a score below 85 was considered unacceptable.

of "drip" or quantity of liquid that separates upon thawing, and at less frequent intervals, determination of volatile acid numbers. The last is a chemical test sometimes used as an indication of relative freshness of fish. Taste characteristics in particular were noted in determining quality since flavor is a deciding factor as to whether a product is in salable condition.

Palatability tests were made by a panel consisting of four or five members of the laboratory staff who were experienced in this type of test. Scores were based on appearance, flavor, and texture of the product. A sample receiving a weighted score below 85 was considered unacceptable. In preparing the fillets for the test, they were thawed at room temperature, brushed lightly with vegetable oil, and baked in a preheated oven at a temperature of 500 F. for 10 to 12 minutes, depending on the size and thickness of the fillets.

The quantity of "drip" which formed upon thawing of the fillets was determined as follows: The frozen fillet was weighed and then placed upon a coarse-meshed wire screen inside of a rectangular-shaped glass dish. The screen was raised slightly above the bottom of the dish so as to permit drainage of the fillet. A sheet of moisture-vaporproof celophane was placed over the top of the dish and taped in place in order to retard loss of moisture from the fillet. After approximately four and one-half hours at room temperature, the thawed fillet was removed, blotted lightly with a paper towel and weighed. The loss in weight represented the "drip."

Results

The discussion of the results will be limited to those for the tight-fitting packages, unless otherwise noted, since loose-fitting packages are never to be recommended for use in frozen food storage and were included in these tests only in an attempt to show differences in weight loss and cavity ice formation which might occur as a result of fluctuating storage temperatures.

The average palatability scores for the striped bass fillets are given in Table I. The tightly-wrapped products held at constant temperatures of – 10 and 0 F., and at temperatures fluctuating between these two points received satisfactory and nearly identical scores at the end of eight months of storage. After nine months of storage, the samples stored under this fluctuating temperature range received the same score as those held at a constant temperature of – 10 F. At this time, the samples held at a constant temperature of 0 F. were not considered satisfactory.

All of these striped bass samples, in the raw state, were generally satisfactory in appearance until after the tenth month of storage. Slight, though almost negligible, surface desiccation occurred at that time on the samples in all three lots. A slight fishy odor was noted at the examination after eight months, and this increased somewhat after each succeeding month. The color was not as bright as that of fresh fillets but was commercially satisfactory.

After only four months of storage at 15 F., the striped bass fillets failed to receive an acceptable score. At the same time, those undergoing temperature fluctuations between 15 and 0 F. were still acceptable. No noticeable surface desiccation had occurred in either lot at this time, and the odor and appearance of the uncooked fillets were satisfactory. The early low palatability scores noted were attributable mainly to adverse changes in flavor and texture.

The palatability scores for the Boston mackerel fillets are given in Table II. On the basis of these scores, there was no apparent deterioration of quality due to fluctuating storage temperatures. The scores for the samples undergoing temperature changes between –10 and 0 F., irrespective of the rate of fluctuation, did not differ greatly from those for samples held at a constant temperature of -10 F and a constant temperature of 0 F. In the case of the samples subjected to temperature fluctuations between 0 and 15 F., the scores dur-

TABLE II—AVERAGE OF TWO (OR THREE) PALATABILITY SCORES FOR TIGHTLY-WRAPPED AND LOOSELY-WRAPPED PACKAGES OF BOSTON MACKEREL FILLETS STORED AT VARIOUS TEMPERATURES

Storage Temperature	Type of Wrap	Palatability Score —Storage Periods in Months 1	2	3	4	5
Constant:						
—10 F.	Tight	95	96	92	89	86
	Loose	98	95	89	86	78
0 F.	Tight	97	96	91	84	81
	Loose	98	96	89	81	76
15 F.	Tight	94	89	71	55	.....
	Loose	96	90	67	60	.....
Fluctuating at four-day intervals:						
Between —10 and 0 F.	Tight	97	97	93	84	.....
	Loose	97	96	87	80	.....
Between 0 and 15 F.	Tight	98	95	71	73	.....
	Loose	95	92	66	66	.....
Fluctuating at three-day intervals:						
Between —10 and 0 F.	Tight	[1]	97	91	88	84
	Loose	[1]	93	91	85	80
Between 0 and 15 F.	Tight	[1]	91	75	67	.....
	Loose	[1]	91	76	59	.....
Fluctuating at one-day intervals:						
Between —10 and 0 F.	Tight	[1]	97	90	85	85
	Loose	[1]	93	88	86	78
Between 0 and 15 F.	Tight	[1]	90	74	51	.....
	Loose	[1]	84	78	51	.....

[1] During the first month of storage, these samples were subjected to temperature fluctuations at four-day intervals. The palatability scores for this period are given in the group "fluctuating at four-day intervals." (See note to Table I for method used in calculating palatability score).

ing the first and second months of storage do not signify any greater deterioration in quality than those for the fillets held at a constant temperature of 15 F. This is also substantially true for the third and fourth months, although the scores at this time were too low to be acceptable.

In regard to the condition of the mackerel fillets prior to being cooked, those held at – 10 F. had only a slightly rancid odor at the end of the five-month storage period. However, a slight fishy odor became apparent in some samples at the end of two months of storage and became stronger as the storage period progressed. Slight darkening of the flesh occurred after the third month. The color was not too attractive after that time. No "rusting" (extreme discoloration of the fat due to oxidation) was apparent in any of the samples.

Some of the mackerel fillets held at 0 F. had a slightly rancid odor at the examination after the third month and some darkening in color had occurred, though no "rusting" was apparent. This was true also, in general, for the fillets undergoing fluctuations in temperature between – 10 and 0 F.

The fillets held at 15 F and at temperatures fluctuating between 0 and 15 F. were slightly rancid after the second month of storage and were showing signs of a yellow discoloration. After further storage, the rancidity became very pronounced and extreme "rusting" and discoloration occurred.

On the basis of these tests, mackerel fillets appeared to have a storage life of about two months at 15 F. and approximately twice this life at the lower temperatures included in the tests.

Volatile acid numbers, a chemical index used to some extent for expressing relative freshness of fish on a numerical basis, were determined at intervals for both varieties of fillets. These values increase as freshness decreases. Table III shows relative values for the different lots after storage for various periods. Although the results cannot be considered statistically significant, they are interesting since they roughly follow the trend shown by the palatability scores. The volatile acid numbers for the samples subjected to fluctuating temperatures generally fall between the numbers for the corresponding samples that were held at a constant storage temperature. No adverse effect due to fluctuating temperatures is apparent. Initial values were not obtained.

The quantity of "drip" occurring upon thawing of both varieties of fillets (Tables IV and V) remained quite small during the entire course of the tests. A slight increase occurred after a few months of storage for the striped bass fillets but was still too small to be of much consequence. Almost negligible changes in the

TABLE III—VOLATILE ACID NUMBERS FOR TIGHTLY-WRAPPED PACKAGES OF STRIPED BASS AND BOSTON MACKEREL FILLETS STORED AT VARIOUS TEMPERATURES

Storage Temperature	Volatile Acid Number				
	Boston Mackerel Fillets	Striped Bass Fillets			
	—Storage Period in Months—				
	4	4	6	8	10
—10 F.	6.4	3.4	4.8	5.0	6.6
Fluctuating between —10 and 0 F. at four-day intervals	6.4	3.8	5.2	5.6	7.0
0 F.	7.6	4.0	5.2	6.0	7.2
Fluctuating between 15 and 0 F. at four-day intervals	9.2	4.0	4.8	5.8	7.4
15 F.	10.4	4.0	5.2	6.6	7.8

TABLE IV—QUANTITY OF "DRIP" IN PERCENT FOR TIGHTLY-WRAPPED AND LOOSELY-WRAPPED PACKAGES OF STRIPED BASS FILLETS STORED AT VATIOUS TEMPERATURES

Storage Temperatures	Type of Wrap	"Drip" in Percent Storage Period in Months									
		1	2	3	4	5	6	7	8	9	10
—10 F.	Tight	1.6	1.8	1.6	1.9	2.1	2.2	2.4	2.0	2.3	2.0
	Loose	1.3	1.3	1.5	1.4	1.7	1.6	2.0	2.1	1.9	2.2
Fluctuating between —10 and 0 F. at four-day intervals	Tight	1.2	1.6	1.6	2.3	2.1	2.4	2.6	2.8	2.4	2.2
	Loose	1.4	1.8	1.8	2.0	1.9	2.4	2.9	2.8	2.5	2.2
0 F.	Tight	1.6	1.5	1.6	1.9	2.2	2.5	2.2	2.1	2.0	1.8
	Loose	1.4	1.8	1.7	1.8	1.7	2.3	2.5	2.5	2.0	2.1
Fluctuating between 15 and 0 F. at four-day intervals	Tight	1.3	1.4	1.5	2.6	2.4	2.6	2.4	3.0	3.2	....
	Loose	1.6	1.9	1.6	1.9	2.6	2.2	2.3	2.7	2.3	....
15 F.	Tight	1.3	1.6	1.7	2.0	2.7	2.4	2.7	2.3	2.0	....
	Loose	1.2	2.0	1.7	1.8	2.6	2.3	2.2	1.6	1.9	....

TABLE V—QUANTITY OF "DRIP" IN PERCENT FOR TIGHTLY-WRAPPED AND LOOSELY-WRAPPED PACKAGES OF BOSTON MACKEREL FILLETS STORED AT VARIOUS TEMPERATURES

Storage Temperature	Type of Wrap	"Drip" in Percent Storage Period in Months				
		1	2	3	4	5
Constant:						
—10 F.	Tight	3.1	3.0	3.1	3.3	3.1
	Loose	2.4	3.0	3.2	3.3	3.5
0 F.	Tight	3.3	3.1	3.2	3.2	3.3
	Loose	2.9	3.1	3.5	3.4	3.7
15 F.	Tight	3.0	2.9	3.2	3.5	.....
	Loose	3.4	2.9	3.2	3.4	.....
Fluctuating at four-day intervals:						
Between —10 and 0 F.	Tight	2.9	2.7	3.4	3.7	.....
	Loose	2.9	3.1	3.1	3.3	.....
Between 0 and 15 F.	Tight	3.1	3.0	3.1	3.5	.....
	Loose	3.2	3.3	2.8	3.2	.....
Fluctuating at three-day intervals:						
Between —10 and 0 F.	Tight	[1]	3.1	3.3	3.8	3.3
	Loose	[1]	3.2	3.5	3.7	4.4
Between 0 and 15 F.	Tight	[1]	3.4	3.9	3.8	.....
	Loose	[1]	3.7	3.6	3.8	.....
Fluctuating at one-day intervals:						
Between —10 and 0 F.	Tight	[1]	2.6	2.9	3.0	3.0
	Loose	[1]	2.8	2.9	3.2	3.2
Between 0 and 15 F.	Tight	[1]	2.6	3.2	3.3	.....
	Loose	[1]	2.9	3.1	3.3	.....

[1] During the first month of storage, these samples were subjected to temperature fluctuations at four-day intervals. The percentage of "Drip" for this period is given in the group "fluctuating at four-day intervals."

amount of "drip" from the mackerel fillets occurred during storage. Fluctuating storage temperatures appeared to have very little effect on the amount of "drip," except for possibly a few of the striped bass samples (Table IV).

Average weight losses for the tightly-wrapped samples remained quite small. Slight increases in weight loss occurred with some of the lots undergoing temperature fluctuations but were still too small to be of any particular significance.

As mentioned previously, fillet samples with loose fitting wrappers were prepared for the tests to permit cavity ice or frost to form in an attempt to measure the desiccating effect due to storage at the different constant temperatures and especially at temperatures which fluctuated. The difference in weight due to the removal of the cavity ice was taken as the measure of the amount of desiccation that occurred. However, there was such a wide variation between amounts of ice found in individual packages and in fact between groups as a whole that no particular relationship or trend was apparent.

One peculiarity was noticed in connection with a number of the tightly-wrapped samples held at 15 F. Some of the mackerel fillets, after only two months of storage, and the striped bass fillets, after six months of storage, showed considerable surface desiccation. This increased as the storage period progressed. Though not as bad, it occurred to some extent with the fillets subjected to temperature fluctuations between 0 and 15 F. This did not happen with the samples held at the other lower temperatures. Weight losses of the affected samples were slightly higher when this occurred. Apparently the cellophane offered less resistance to moisture-vapor transmission at the higher temperatures, though why this occurred sooner with the mackerel fillets is not known.

Discussion and Conclusions

The effect of temperature on the storage life of frozen foods has been a subject of considerable controversy. Until quite recently, it was not at all uncommon to find statements in the literature signifying that storage temperatures in the range of 10 to 20 F. were considered satisfactory. Even today, after numerous investigations have shown otherwise, these higher temperatures of storage are still not held in disfavor by some handlers of frozen foods.

Appreciable differences, due to storage temperatures, were found in the storage life of the fillets used in these tests. The striped bass remained in a satisfactory condition for eight to nine months at – 10 F. and 0 F. temperatures. At 15 F., however, the storage life was limited to only three months. For the Boston mackerel, the storage life at 15 F. was only about two months as compared to approximately twice that at – 10 and 0 F. temperatures.

Though often stressed in connection with frozen food packaging, the need for eliminating air spaces within the package was further brought out by these tests. Localized desiccation was quite evident on the loosely-wrapped fillets after only one month of storage and became extreme after only two months. Rancidity and discoloration occurred much sooner and progressed more rapidly with these samples. The differences in quality due to tight and loose wrapping were also reflected in the palatability scores, though they were not so evident during the first part of the storage period.

The findings regarding the effect of fluctuating storage temperatures on the quality of the frozen fillets are based on storage conditions that are much more severe than would be apt to be encountered commercially except under extreme circumstances. The samples were stored individually on shelves, with free air circulation about each package, and without benefit of protection from mass packaging in a carton. Large temperature fluctuations occurred during an average of every four days for a period of up to 10 months for the striped bass; and at one-, three-, and four-day intervals for the Boston mackerel for at least four months. With the possible exception of those shifted at one-day intervals, there was ample time for the temperature of the samples to become completely adjusted to correspond with that of the storage room in which they were held.

Other workers or writers have sometimes included higher temperatures than those used in tests of this type or even suggested partial thawing of the product in their discussion of the effect of fluctuating temperatures. Although such conditions may be and are at times encountered under commercial handling, it was felt that the temperature in these tests should not exceed 15 F., as an entirely different set of conditions may otherwise be introduced due to increased bacterial activity and other factors aside from temperature effects, as such.

The data obtained in these tests on approximately 500 samples of striped bass and Boston mackerel fillets suggest that fluctuating temperatures, in themselves, do not have an appreciable adverse effect on the quality of frozen fish fillets, at least in the range covered in these experiments. Instead, any readily apparent effect would seem to be more likely related to the average storage temperature encountered during the fluctuations.

Owners Say Supervising Engineer Not Needed

REPRESENTATIVES of concerns having large refrigeration or air conditioning systems appeared before the Kansas City city council general committee to protest a proposed amendment to the building code. The amendment would require an engineer to be on the premises at all times in the operation of refrigeration systems of more than sixty tons containing group 1 refrigerant (Freon) or any system of more than ten tons using group 2 or 3 refrigerants.

Reed McKinley, director of public works, said he was under the impression that the present provision of the building code was intended to accomplish the same purpose. The city counselor's office, however, has given an opinion to the contrary. He explained he had requested introduction of the amendment to make the provision clear.

E. A. Weishaar, civic secretary of the Chamber of Commerce, submitted a letter from E. L. Winn, chairman of the building code committee of the Chamber, stating that the committee considers the amendment unnecessary because no danger to health or safety is involved.

William L. Cassell, mechanical engineer and a member of the citizens committee which wrote the code, and several other members of the committee, said the original code submitted to the city by the citizens committee did not contain the requirement. He said they were surprised later to find that the requirement had been put into the code before it was adopted by the city council.

Max E. Sander, president of local union No. 6 of the International Operating Engineers, and W. S. Buckles, an official of the union, urged passage of the amendment. They said the presence on the premises of a licensed engineer was needed to assure protection of the public at such places where large refrigeration or air conditioning units are operated.

Committee Chairman Robert J. Benson said they expected to take action on the measure at an early date.

HIGH COURT DECISIONS REVIEWED

Higher court decisions may reverse older law. Some of the recent cases, pertaining to ice companies, but with a wider business range are given brief reviews.

LEO T. PARKER

DURING the past few months the higher courts rendered many outstanding decisions involving ice companies and other concerns. These decisions are reviewed for the purpose of assisting readers to avoid similar expensive law suits. Many of the decisions explained in this article reverse the older law, and readers who want details of any law suit may conveniently refer to the citation, and read the complete decision in any good library.

Negligence Vs State Law

CONSIDERABLE discussion has arisen from time to time over the legal question: If one is injured in an automobile whose driver is reckless and violating a state law at the time of an accident, can the injured person recover damages from the driver of another automobile whose negligence caused the accident?

According to a recent higher court the answer is yes.

For example, in Winner v. Moreland Ice & Fuel Company, 55 Atl. (2d) 582, one Winner sued the Moreland Ice & Fuel Company for heavy damages for injuries sustained when a passenger automobile in which she was riding as a guest-passenger was run into by a motor truck owned by the Moreland Ice & Fuel Company.

The counsel for the ice company contended that there can be no damage allowance because at the time of the accident the front seat of the passenger car was occupied by more than three persons in violation to a state law.

Nevertheless the higher court held the Moreland Ice and Fuel Company liable in $15,000 damages to Winner and said that the fact that the driver of the passenger automobile which collided with the truck, violated a state statute making the presence of more than three persons on the front seat of an automobile "reckless driving" this did not bar one of the occupants of the passenger automobile from sueing and recovering damages from the Moreland Ice and Fuel Company or its truck driver whose negligence caused his injuries.

Purchaser Fails to Prove Assertions

MODERN higher courts consistently hold that a verdict rendered by a lower court will not be reversed unless the testimony proves conclusively that the lower court's verdict was clearly in error. Hence, a purchaser cannot expect a higher court to reverse of lower court unless he proves his assertions.

For example, in Weideman v. Christopher, 51 S. E. 2d) 601, a manufacturer of ice making and refrigeration equipment sued one Weideman for $5,149.01, besides interest, the purchase price of certain refrigeration equipment. Weideman asked the court to allow him the sum of $6,075 damages lost by him which was occasioned by the failure of the manufacturer to deliver the complete equipment on the promised date.

Since Weideman failed to prove that the manufacturer had promised to make delivery of the complete plant on any particular date, the lower court refused to hold Weideman entitled to recover damages from the manufacturer and also ordered Weideman to pay the manufacturer $5,149.01, plus interest, balance due on the plant. The higher court approved the verdict and said:

"The only question, as we see it is whether there is any evidence to sustain that which the lower court found. We have read the record of evidence carefully. Although it is in conflict in some particulars, there is ample evidence to sustain the judgment of the lower court."

Incompetent Driver

ACCORDING to a recent higher court one injured by a motor vehicle owned by an ice company may win the suit if he proves that the company's employee who drove the truck was incompetent, reckless and unreliable.

For example, in Terry v. Capital Ice Company, 55 S. E. (2d) 926, one Terry sued the Capital Ice Company to recover damages arising out of a collision between Terry's automobile and Capital Ice Company's truck. It was alleged by Terry that at the time of the collision the ice company's truck was being operated by an incompetent, reckless and unreliable colored boy, without driver's license, and that this proof was enough to result in the ice company being liable in damages for his injuries.

The counsel for the ice company argued that past reputation of the driver had nothing to do with nor bearing on the present case, since in order to recover damages Terry must prove that his injuries were caused by negligence of the truck driver at the time the accident occurred.

In subsequent litigation the higher court held that whether the driver of the truck at the time of the injury was "incompetent, reckless and reliable" was valuable testimony in favor of Terry.

Must Use Care

MODERN higher courts consistently hold that a cold storage warehouse company must at all times exercise reasonable care to protect stored goods, or he is liable in damages for loss or injury to the goods.

For example, in Ten Cold Storage Warehouse Company v. United States, 173 Fed. (2d) 861, the owner of a warehouse was held liable for $23,313.60, the value of frozen eggs which were destroyed in a cold storage warehouse.

The testimony showed that through no fault of the warehouseman the warehouse collapsed one morning. However, the refrigeration plant continued to operate efficiently and the eggs were not damaged. There was that day no indication of fire or smoke. The warehouseman made necessary arrangements to have the eggs removed from the warehouse the following day but did not put a watchman on duty.

However, that night the warehouse caught fire and destroyed the eggs. In holding the warehouseman liable the court said:

"The warehouse company could have anticipated that fire would result; but neither cut off the current, made an adequate inspection to determine the condition of the wires, nor notified the fire department. . . .

Ordinary care required the continuous presence of a watchman in the night, under these circumstances."

This court also held that although the warehouse receipt contained a clause that the eggs were stored at the owner's risk from fire, change of temperature, or any other cause, this did not relieve the warehouseman for liability for his negligence.

For comparison, see Dixie Storage, Inc. v. Cox, 27 So. (2d) 672. Here the testimony showed facts that meat was placed in a cold storage warehouse, and it was in good condition when delivered to the warehouseman. Several weeks later an inspector for the state inspected the meat and found it spoiled. In subsequent litigation the higher court held the warehouseman liable, and said:

"If due care had been exercised the probabilities are it would not have spoiled."

Cutting Ice Price Not Unlawful

CONSIDERABLE discussion has arisen from time to time over the legal question: When and under what circumstances is cutting ice prices to eliminate competition illegal? It is well established law that under the Robinson-Patman Act and the Sherman Anti-Trust Act it is illegal for an ice manufacturer to cut prices on ice for the purpose of monopolizing a part of the trade or commerce and destroying competition in interstate commerce. However, where the testimony does not show that the price cutting was done to impose restraints on, or substantially affect interstate commerce the price cutting is not illegal.

For example, in Atlantic Company v. Citizens Ice & Cold Storage Company, 178 Fed. (2d) 453, the testimony showed facts, as follows: The Citizens Ice and Cold Storage Company is engaged in interstate commerce in the manufacturing sale, and distribution of ice in a great many cities and towns in Georgia, including Colquitt and Bainbridge, and in other states. In 1947 an ice company, in Colquitt, and one at Bainbridge commenced the manufacture and sale of ice. At that time in practically every city where Citizens Ice and Cold Storage Company had no competition its price of ice was 50 cents per 100 pounds. Soon after the new ice companies began their operations, the Citizens Ice and Cold Storage Company cut its prices.

The new ice company sued the Citizens Ice and Cold Storage Company for an injunction, restraining it from cutting prices in the sale of ice in Bainbridge and Colquitt, Georgia, in violation of the Sherman Anti-Trust Act and Robinson-Patman Acts.

The new ice company alleged that the Citizens Ice and Cold Storage Company has attempted to monopolize "part of the trade and commerce among the several states in violation of Sec. 2 of the Sherman Anti-Trust Act (15 U.S.C.A. 2)", and that in violation of the Robinson-Patman Act, and in the course of interstate commerce and for the purpose of destroying competition and eliminating competitors in the course of said commerce, by selling ice in Bainbridge and Colquitt, Georgia, at prices lower than those exacted by it elsewhere in the United States.

During the trial the testimony proved that actually the Citizens Ice and Cold Storage Company had entered into the price cutting for the purpose of destroying competition and eliminating the new ice company as a competitor. However, further testimony showed that 99 per cent of the price-cut ice was sold intrastate, and that its sale of ice to truckers and railroads to transport perishable goods into other states constitutes a part of interstate commerce, but that the total of these sales was less than one per cent of the total business involved in the local price war. Nevertheless the lower court held against the Citizens Ice and Cold Storage Company and granted an injunction against further price cutting.

The Citizens Ice and Cold Storage Company appealed to the higher court, admitting that the price war was one to stifle competition and gain control of the market, and that some of the sales complained of were in interstate commerce, but argued that since price was a local one, and all but an insignificant part of the sales were undisputedly made to local customers and intrastate it should not be held liable.

It is interesting to observe that the higher court reversed the lower court and said:

"We accept the finding that the purpose of the price war was to suppress competition by injuriously affecting plaintiffs (Atlantic Company) as competitors. . . . A consideration of the record in this case leaves us in no doubt that the evidence is not sufficient to support the conclusion on which the injunction was based, that in doing the acts complained of, the defendant was, in violation of the Sherman Act, attempting to monopolize a part of the trade or commerce among the several states, and, of the Robinson-Patman Act, cutting prices for the purpose of destroying competition and eliminating plaintiffs as competitors in the course of said commerce.

We think it perfectly clear: that what, and all, that is made to appear is a war of local price cuttings; that its effect, if any, upon interstate commerce is insubstantial, inconsequential, and remote; and that the finding, that the price cutting was done to impose restraints on, or that it substantially affected interstate commerce, is without support in the evidence. The order granting the interlocutory injunction is reversed. . . ."

Licensing Ordinance Not Applicable

MODERN higher courts consistently hold that under no circumstances is a city ordinance applicable to an ice manufacturer unless its meaning clearly includes such ice manufacturer.

For example, in Alabama Ice & Utilities Company v. City, 40 So. (2d) 198, it was shown that a city passed an ordinance imposing a license fee on "storers" of gasoline, oils, etc., and defining a storer as person who ships gasoline, oils, etc., into the city in lot quantities of as much as 50 gallons and there stores the same and withdraws or uses the same for any purpose.

In subsequent litigation the higher court held that the Alabama Ice & Utilities Company, who from time to time ordered from other states Diesel oil in lots of 50 gallons or more for fuel in operating its Diesel engines used in the manufacturing of ice, was not subject to the ordinance, since he did not ship or cause to be shipped oils into the city. The court said:

"It is not contended that appellant (Alabama Ice and Utilities Company) is a distributor, seller or retail dealer, but does store Diesel oil on its premises in lots of fifty gallons or more. . . . Taxing statutes are to be strictly construed against the taxing power. . . . We are unable to conclude that appellant (Alabama Ice and Utilities Company) is a 'storer' within the definition contained in the ordinance."

Picketing is Prohibited

RECENTLY the Supreme Court of the United States held that picketing which causes or results in violation to a state law is invalid, and the court will grant an injunction against the picketing.

For example, in Giboney v. Empire Storage & Ice Company, 69 S. Ct. 684, this question was presented the Supreme Court of the United States: Can a labor union lawfully picket an

ice company for the purpose of forcing the latter into a combination which had the purpose of preventing the sale of ice to nonunion peddlers, and thus to require the ice company to make discrimination in its sale of ice in violation of the state's anti-trade restraint law?

This court held that the union could be enjoined without violating the union's constitutional guarantees of freedom of speech and press.

The testimony showed that most of the non-union peddlers refused to join the union. To break down their resistance the union adopted a plan which was designed to make it impossible for nonunion peddlers to buy ice to supply their retail customers. Pursuant to the plan the union set about to obtain from all city wholesale ice distributors agreements that they would not sell ice to nonunion peddlers. Agreements were obtained from all distributors except the Empire Storage and Ice Company. Empire refused to agree. The above mentioned picketing was then commenced. In enjoining the union from this picketing, the higher court said:

"Thus the avowed immediate purpose of the picketing was to compel Empire to agree to stop selling ice to nonunion peddlers. . . . Agreements and combinations not to sell to or buy goods from particular persons, or to dictate the terms under which transportation will be supplied, are well recognized trade restraint practices which both state and national legislation can and do prohibit. . . . We think the circumstances here . . . justify restraint of the picketing which was done in violation of Missouri's valid law. . . ."

Not a Manufacturer

RECENTLY a higher court held that an ice company is not a manufacturer and therefore cannot escape taxation on the contention that it is within scope of state or city laws which exempt manufacturers from payment of taxes, license fees, etc.

For example, in Foert v. City, 69 Atl. (2d) 405, it was shown that a city passed an ordinance imposing annual mercantile license taxes upon persons engaged in certain occupations and businesses. A clause in the ordinance exempted from paying of the tax all persons who sell merchandise they manufacture.

In holding that an ice manufacturer is not exempt from paying the annual tax, the court said:

"The city ordinance exempts persons who vend articles 'of their own growth, production or manufacture.' "

Not Jeopardized

ACCORDING to a recent higher court a minority stockholder in an ice corporation cannot have a receiver appointed for the corporation on complaints amounting to ordinary mis-management.

For example, in Kinnebrew v. Louisiana Ice Company, 43 So. (2d) 798, it was shown that one Kinnebrew a stockholder in the Louisiana Ice Company sued the latter for appointment of a receiver of the corporation, on the grounds that his interests were being jeopardized by "gross mismanagement" of the corporation's business by its officers, directors and majority stockholders.

Kinnebrew proved these facts: The corporation grossly mismanaged the corporation's business and misapplied its property and funds; the officers, directors and majority stockholders were guilty of gross mismanagement in allowing liens to be created and judgments rendered against the corporation; the managing officers, directors and majority stockholders devoted the corporation's earnings to payment of its debts, instead of dividends; the corporation's managing officers, directors and majority stockholders were guilty of gross mismanagement by paying excessive salaries to corporation officers where $3,600 was paid to one of them for one year, and $200 per month to another as secretary-treasurer and manager and corporation's president; that the corporation was really operated by its principal creditor who was not a director, officer or employee of the corporation, but a member of a partnership which purchased the entime output of corporation's ice plant, and occupied rented office on the plant premises to observe, advise and aid in operation of corporation's business; and that no complete set of books were kept as advised by a certified public accountant employed by the corporation to bring its records up to date and install adequate system of records.

It is interesting to observe that the higher court held that these acts did not constitute "gross mismanagement" so as to entitle Kinnebrew, a minority stockholder, to the appointment of a receiver for the corporation. The court said:

"While we did not specifically point out our finding it was considered with the contention that there was mismanagement of the corporate affairs and other contentions advanced by the appellants. We are of the opinion that the contention is not supported by the evidence."

Symposium On Mechanical Properties Of Metals At Low Temperatures

MORE than 150 leading metallurgists and metallurgical engineers attended the Symposium on the Mechanical Properties of Metals at Low Temperatures held at the National Bureau of Standards in Washington, D. C., May 14 and 15, 1951. This was the second in the series of twelve symposia to be held in celebration of the fiftieth anniversary of the NBS, and papers on recent research were presented by representatives of industry, universities, and Government. The program was under the joint chairmanship of Thomas G. Digges and George A. Ellinger of the NBS Metallurgy Division.

Mechanical Behavior

A knowledge of the mechanical behavior of metals at low temperatures is of vital importance to an understanding of their rheological properties and to their successful application in low-temperature service. Engineering applications of metals at low temperatures are constantly increasing, as evidenced by the rapid growth of the refrigeration industries and the increasing demand for the liquefaction of many gases, their transportation and storage. Armed Services equipment, such as airplanes, other transportation vehicles, and weapons, frequently must operate at low temperatures. Embrittlement of metals in cold atmospheres is a source of concern to designers, manufacturers, and users.

For several years the National Bureau of Standards has been conducting an extensive investigation of the influence of low temperatures on the mechanical properties of metals. Results obtained thus far in the program have provided a great amount of useful information on the effect of composition, heat treatment, and other variables.

The opening paper of the Symposium, "Mechanical Properties of High-Purity Iron-Carbon Alloys at Low Temperatures", by Mr. R. L. Smith, Professor G. A. Moore, and

Professor R. M. Brick of the University of Pennsylvania, summarized the effects of carbon content, within the range of 0.05 to 0.5 percent, on tensile properties and on natural stress-strain curves at temperatures from –185 C to room temperature. Increases in carbon content resulted in increases in stresses at yield points, in flow stresses at constant strain and constant temperature, and in fracture stresses. Decreases were noted in total strain at fracture. The transition temperature, based on the energy required to fracture tensile specimens, is about –160 to –170 C and is independent of the carbon within the above range.

Brittle Fracture

A paper, "Brittle Fracture in Ship Plates," presented by Dr. M. L. Williams of the National Bureau of Standards, showed that although failures have been reduced by improvement in design details and welding workmanship, many failures are traceable to the quality of steel, especially with respect to the notch sensitivity as measured by the 15 ft-lb transition temperature in Charpy V-notch tests. Notch sensitivity was found to increase in carbon, phosphorus, molybdenum, or arsenic content and grain size and to decrease with increase in silicon, manganese, copper, or nickel content. The combined effects of these elements were shown not to be simply additive.

Research in Europe

Dr. N. P. Allen of the National Physical Laboratory, England, described "Recent European Work on the Mechanical Properties of Metals at Low Temperatures." An account was given of research in Europe since 1940, including the effect of low temperatures on the following: behavior of common engineering metals and alloys; elastic constants; mechanisms of slip; brittle fractures of ferritic alloy steels as affected by alloy content, heat treatment, etc. Special attention was given to work at the National Physical Laboratory on the effect of carbon, oxygen, manganese, and combinations of these elements on the low-temperature properties of high-purity iron (99.96 percent Fe).

Steel for Low Temperatures

A discussion of "The Manufacture of Steels for Low-Temperature Service", by Dr. J. B. Austin of the U. S. Steel Company, pointed out many of the salient factors necessary for the production and processing of steels suitable for low-temperature service. Among these were fine grain size; suitable microstructure (in ferritic steels, a tempered martensitic structure of desired hardness level is preferable to a pearlitic structure of the same hardness level); complete deoxidation of steel, preferably with aluminum; and addition of certain alloying elements. The choice and amount of the beneficial alloying elements however, depend upon precise service conditions and economic factors such as availability and cost.

Chromium-Copper Nickel Steel

A paper on the "Development and Application of Chromium-Copper-Nickel Steel for Low-Temperature Service", by Messrs. Walter Crafts and C. M. Offenhauer of Union Carbide and Carbon Research Laboratories, Inc., presented data showing how a normalized low-allow steel suitable for low-temperature service down to —100 C was developed by addition of approximately 0.5 percent each of manganese, copper, nickel and chromium. Emphasis was placed on the beneficial effect of deoxidation with aluminum to assure fine grain size, increasing the residual aluminum content to approximately 0.2 percent gives an additional improvement, thus producing a steel suitable for use at slightly lower temperatures.

Austenitic Stainless Steels

A study of "The Properties of Austenitic Stainless Steels at Low Temperatures" was given by Dr. V. N. Krovobok of the International Nickel Company, Inc. Data on the effect of low temperatures on the modulus of elasticity, ductility, fatigue, impact, tensile impact, tension, and other mechanical properties were summarized. The effect of cold-working at low temperatures and the beneficial effect of low temperatures on ductility characteristics were discussed in detail. The beneficial influence of the low carbon content of these alloy steels on their mechanical properties at low temperatures was also described.

Metals in Aircraft

A paper on the "Application of Metals in Aircraft at Low Temperatures", by Messrs. J. B. Johnson and D. A. Shinn of Wright-Patterson Air Force Base, discussed briefly the relationship of the properties of metals as determined by conventional laboratory tests and those selected by the designer. Data on tests of aircraft metals at temperatures down to —420 F were presented. The selection of a steel with a higher content of strategic alloying element than is necessary for the specific application was discouraged.

Effects in Fracture

In a paper on "Dimensional Effects in Fracture", Professors C. W. MacGregor and N. Grossman of Massachusetts Institute of Technology discussed the influence of specimen size and the effect of various ratios of combined stresses on the transition temperature from ductile to brittle fracture. Slow bend tests were made at various temperatures with flat circular disks of 0.95 percent carbon steel simply supported around the circumference and loaded by a concentric force at the center; the results indicated that the size effect in ratio ranges of 6 to 1 was insignificant when similitude of specimens and test conditions was maintaned. Other experimental data indicated that the transition temperature of this steel increases about 60 F as the biaxial stress ratio is varied from 0.483 to 1.0.

Tensile Properties

The closing paper, "Tensile Properties of Copper, Nickel and Some Copper-Nickel Alloys at Low Temperatures", by Messrs. G. W. Geil and N. L. Carwile of NBS, discussed the results of tension tests made at temperatures ranging from +100 C to —196 C. Graphs of true stress vs strain did not exhibit the commonly accepted parabolic relationship. The initial and ultimate strengths, true stresses at maximum load and at initial fracture, were shown to increase continuously with decrease in temperature. The true strain at maximum load increased slightly with decrease in temperature, but no significant change in the strain at fracture was observed. In general, the rates of work hardening at specific true strains increased with decrease in temperature and, in the case of the alloys, were affected greatly by their compositions.

Motion Picture

An interesting motion picture on the transformation of white (β) tin to the grey (α) form at —20 C was shown. This picture, which was filmed by the University of Pennsylvania, was narrated by Dr. M. J. Diskind of the Franklin Institute.

THE ICE INDUSTRY

NATIONAL ASSOCIATION OF ICE INDUSTRIES

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THIS MONTH IN BRIEF

Annual survey of ice sales by National Association of Ice Industries shows total sales in 1950 of 33,897,798 tons. Processed ice sales were 3,981,017 tons, slightly more than 11 percent of the total.

Ice sculpture is used by Rhode Island ice company to publicize the ice business. In Florida, table decorations of ice and flowers made a big hit at a tea dance.

Selling ice as people like it, through modern vending stations, has enabled an ice distributor to counteract losses to domestic trade and increase his normal sales volume.

A complete safety program designed for training new and inexperienced workers in safety practices has reduced accidents and improved employee relations for this middle western ice distributor.

Shrimp boats at St. Augustine, Fla. provide a market for snow ice. Ice conveyor and crushing equipment does the work efficiently and economically.

Reports from unit ice associations show activities in all sections of the country.

33,897,798 TONS OF ICE SOLD IN 1950

Annual survey shows 1950 ice sales 12 percent above those of 1940. Cubed, crushed and sized ice almost hold their own in all sections.

ICE sales during 1950, compiled by the National Association of Ice Industries, supplied by more than 2,000 ice plants which cooperated in this annual survey are shown in the accompanying tabulation.

Although these figures do not reflect an optimistic picture of industry-wide sales, they should not alarm or surprise any ice man who was in business during 1950. He knew what had happened in his own area but, of course, did not know the results for the country as a whole. Margin for error in these figures is slight because the more than 2,000 plants reporting represent a good cross-section of every region in the country.

Adverse Weather

Unfavorable weather conditions nationally for the second successive year lent credence to the average Iceman's opinion that total national tonnage would drop below the 1949 figure. Average drop by Divisions, as will be noted from Table I, varied from a maximum of almost 24 percent to a lesser decline of 8.5 percent. This trend ran parallel with temperatures in areas affected: New England (off 23.98 percent) had unusually cool, rainy weather and practically no spring; Pacific Coast (off 8.5 percent), although below normal, weatherwise, was not nearly so unseasonable as many other sections of the country.

In some areas crop failures had an adverse affect on ice sales. The Pacific Coast apparently was not concerned as much with crop failures as it was by cooler than normal weather. Southern and Southeastern states were hardest hit by poor harvests of ice-consuming crops, especially in peaches.

When scanning the figures shown in Table I it should be borne in mind that national tonnage still tops the 1940 pre-war figure by 12 percent.

While all processed ice sales show a decline, the figures are encouraging in that cubed, crushed and sized ice sales show a tendency to hold their own despite a weather setback.

1950 Ice Sales

Total sales 33,897,798 tons
—18 percent off from 1949

Processed ice 3,981,017 tons
—4.52 percent off from 1949

Ice Cubes 738,999 tons
—8.46 percent off from 1949

Sized ice 1,787,295 tons
—3.81 percent off from 1949

Crushed ice 1,454,725 tons
—3.28 percent off from 1949

Natural ice 220,336 tons
—6.5 percent of total sales

Operating Load Factor was 37.11 percent for the year, 7.42 percent below 1949

Total Daily Production Capacity of plants in active operation was 250,276 tons, 1.6 percent less than in 1949.

Total Ice Storage space in use, 3,629,833 tons, 6.87 percent less than 1949.

Processed Ice Sales

In glancing over (Table II) on processed ice sales, it might be well to consider that 1947 was the all-time high year for cube sales; and that both crushed and sized ice were at their all-time peak in 1949. Sales of cubes, 8.46 percent below 1949, were the hardest hit when compared with 1947, off 12.98 percent from that period. On the other hand, crushed and sized ice sales were down only slightly from 1949 and the sales of crushed ice were still well above the years 1948 and 1947. This condition may reflect the progressive efforts of some ice companies to push iced vegetable and poultry displays and the sale of prepared ice to owners of mechanical refrigeration.

Crushed ice sales took a sharp rise in five regions to show a 9.7 percent gain in those areas.

Only in three areas were sized ice sales off sharply. All of these regions had a cool, wet summer and a severe winter.

Northern areas and the Mountain States showed marked declines in ice cube sales. Only the Pacific Coast had an increase in total processed ice sales with 11,496 more tons in 1950 than in 1949. Coincidentally, percent of total tonnage loss was least in that area.

A most encouraging finding is apparent from the figures in Table III "Percentage of Companies Providing Processed Ice Service." The tabulation shows that a constantly increasing number of companies continue to look into the profit-making possibilities in the "Premium Ice" field. In every category there is an upward trend in the number of reporting companies which provide some form of processed ice service. Crushed ice, which accounts for so many new uses for ice, shows a 15 percent increase providing that service, compared with 1948.

For the first time, more than a third of the reporting companies are making ice cubes, and sized ice service ice continues its upward trend. It is rather significant to note that of the companies reporting some form of processed ice service better than 11 percent offer all three classes of service and almost 28 percent offer at least two classes.

Processed ice figures bring into sharp focus the results of the 1949

TABLE I—TOTAL ICE SALES IN UNITED STATES FROM 1946 THROUGH 1950

	1946		1947		1948		1949		1950	
Division	Tons	% Change Over 1945	Tons	% Change Over 1946	Tons	% Charge Over 1947	Tons	% Change Over 1948	Tons	% Change Over 1949
New England	2,802,556	+ 4	2,774,236	—1 01	2,303,430	—16 61	2,202,420	— 4.31	1,681,771	—23.63
Eastern States	10,436,261	+2 98	10,105,640	—3.17	8,805,881	—12.75	8.0 9,142	— 8.07	6,443,032	—20.34
Southeastern	6,964,295	+2.01	6,652,239	—4 48	6,189,128	— 6.94	5,508,501	—10.93	4,563,314	—17.15
Southern	4,207,661	+2 01	4,143,612	—1 52	3,956,031	— 4.53	3,334,003	—15.66	2,649,015	—20.54
Southwestern	6,530,299	+6 03	6,387,024	—2 19	5,934,605	— 7.08	4,826,535	—18.61	4,248,922	—11.96
Great Lakes	10,688,175	+4.98	10,184,773	—4.70	8,728,344	—14.28	7,616,718	—12.67	5,960,862	—21.73
Western	4,466,803	+7 12	4,353,010	—2 55	3,757,786	—13.63	3,222,875	—14.17	2,580,702	—19.92
Mountain States	1,720,119	+6.71	1,749,371	+1.70	1,573,569	—10.04	1,379,608	—12.26	1,063,307	—22.92
Pacific Coast	5,817,558	+1 47	5,808,698	—0 15	5,080,038	—12.53	4,576,302	— 9.84	4,204,076	— 8.13
Northwestern	802,702	—1 06	806,018	+0 41	661,409	—16 71	586,354	—11.28	502,797	—14.25
TOTAL U. S.	54,436,519	+3 52	52,964,621	—2 81	46,990,212	—11 28	41,342,458	—12 01	33,897,798	—18.00

TABLE II—TOTAL ESTIMATED SALES OF PROCESSED ICE IN TONS

	Ice Cubes			Sized Ice			Crushed Ice		
Division	1948	1949	1950	1948	1949	1950	1948	1949	1950
New England	58,831	67,532	58,468	45,327	56,643	50,772	52,194	66,087	53,791
Eastern States	271,596	252,691	217,543	418,450	450,266	411,597	188,449	209,472	170,799
Southeastern	64,605	66,224	65,856	267,239	267,403	268,424	164,854	170,873	153,096
Southern	10,422	9,990	9,648	72,819	67,777	67,825	54,546	49,956	43,903
Southwestern	15,993	16,225	14,967	163,337	165,663	157,947	487,303	456,598	491,013
Great Lakes	189,886	178,942	159,774	443,279	437,251	428,781	224,025	273,524	228,006
Western	88,721	77,299	72,985	168,189	168,435	162,331	152,998	159,812	160,249
Mountain States	16,007	14,135	12,268	49,551	46,791	43,806	16,890	20,177	25,166
Pacific Coast	132,084	123,396	126,888	165,428	177,133	175,488	56,218	52,660	62,309
Northwestern	578	897	602	14,010	20,881	20,324	36,915	44,944	66,391
TOTAL U. S.	848,723	807,331	738,999	1,807,629	1,858,243	1,787,295	1,434,392	1,504,103	1,454,723
% Change Over Preceding Year	— 05%	—4.877%	—8.46%	+6.02%	+2.80%	—3.81%	+.07%	+4.86%	—3.28%

TABLE III—PERCENTAGE OF COMPANIES PROVIDING PROCESSED ICE SERVICE

	Percentage of Reporting Companies Providing								
	Ice Cube Service			Sized Ice Service			Crushed Ice Service		
Division	1948	1949	1950	1948	1949	1950	1948	1949	1950
New England	55.7%	65.6%	62.2%	27.9%	53.1%	40.5%	41.8%	65.6%	73.0%
Eastern States	38.2%	38.8%	42.7%	30.9%	40.8%	41.7%	40.0%	56.3%	61.5%
Southeastern	16.6%	12.5%	16.7%	19.7%	25.1%	33.3%	44.8%	62.2%	70.2%
Southern	7.5%	11.5%	11.8%	21.7%	29.5%	34.2%	29.0%	57.7%	56.6%
Southwestern	4.7%	15.7%	12.2%	15.3%	21.9%	24.3%	56.4%	73.2%	75.7%
Great Lakes	41.3%	48.0%	53.7%	32.7%	44.1%	48.3%	40.7%	56.4%	53.9%
Western	25.9%	29.7%	33.3%	25.9%	35.6%	37.5%	50.0%	60.2%	64.6%
Mountain States	38.1%	52.2%	36.8%	33.4%	43.5%	42.1%	38.1%	65.2%	63.2%
Pacific Coast	63.2%	62.1%	70.6%	26.2%	37.8%	32.4%	31.6%	54.1%	47.1%
Northwestern	15.3%	22.7%	23.5%	15.3%	45.4%	52.9%	45.0%	54.5%	47.1%
TOTAL U. S.	28.1%	31.76%	34.8%	25.3%	35.46%	38.3%	48.5%	60.33%	63.5%

national survey. The NAII Research Department conducted a survey to determine how much iceman's ice is used by mechanical refrigerator users. It showed that 48 percent of these families, about 14,000,000, purchase cubed, crushed and sized ice for parties, picnics and homemade ice cream. This would indicate further that processed ice sales are less dependent on seasonal weather. Parties know no season!

It should be noted that some companies have shown increases which do not show up in an average report. Some have done exceptionally well in the sale of processed ice all year around. These companies have carried on a vigorous promotional campaign to induce mechanical refrigerator owners to supplement their needs with iceman's ice.

Again in 1951 spring weather has been spotty. An old adage in the Ice Industry that "we never get three cool summers in a row" holds much hope for the optimistic Iceman.

Note the wide fluctuation of the percent of change between 1950 and 1949 ice sales in all categories. True, almost all areas show losses; yet, the many areas which show slight declines show that tighter sales campaigns do bring results. There are new fields to conquer to offset losses to the home-users of ice. The same is possible in the commercial sale of ice to produce, meat and poultry retailers. More aggressive methods must be employed to combat the sale of "on premises" ice-making machines. Vending machines properly located have proved worthwhile in many areas to service the domestic business. At the same time it has cut down the high cost of delivery. Every effort should be made to improve service. And it is also important to let the public know exactly what kind of service you can offer.

Revised Control of Ice Prices Issued

BULLETIN: A late announcement from the National Association of Ice Industries states that ice price regulations along the line discussed in the bulletin summarized below has been signed. Neither the effective date nor official publication of the regulation had been determined.

THE Ice Industry Advisory Committee meeting scheduled to be held in Washington, June 25, was postponed indefinitely by the Office of Price Stabilization. This meeting had been scheduled to work out a plan for control of ice prices. Representatives of the OPA said they had a program under way for the ice industry, approval of which they felt would make committee meetings unnecessary.

An explanatory bulletin issued by the National Association of Ice Industries states that efforts to promulgate a regulation for the ice industry had, up to June 30, proved unsuccessful. However, while there is no specific information on details of any regulations now being formulated, it is expected that plans will be devised to relieve many of the industry's pricing ills. Subject to modifications, the regulation that is being prepared and is currently on its way through OPS is expected to accomplish the following results.

1. Take ice permanently out from under CPR-22.

2. Place the administration of price control for the ice industry in the hands of the OPS Field offices, delegating to these offices sufficient authority to receive, process, and deny or approve, any and all individual ice company applications.

If this regulation is not issued, the ice industry stands exactly where it stood last January 25, except that OPS does have an Ice Industry Advisory Committee appointed. This, in itself, will present a saving of time if it becomes necessary for OPS to meet and consult with the committee. Normally three or four weeks are required in getting an advisory committee set up. Presumably, an early meeting of the Committee will be called for the purpose of formulating a specially designed ice regulation if the aforementioned one now "in the works" fails to materialize.

General Overriding Regulation No. 10

The Major features of GOR-10 are as follows:

1—It permits a manufacturer to apply for an upward adjustment of his existing ceiling prices, if as a result of such prices he is forced to operate at a loss with respect to his over-all manufacturing operations.

2—In submitting his application, the manufacturer must show that his losses are not attributable, among other factors, to the following: "seasonal," "temporary," "non-recurring," "reduction in volume below the normal economical capacity of his plant," etc.

3—The manufacturer has to submit, along with his application, a tremendous amount of factual information and economic data regarding his operations.

4—If, after 30 days from the receipt of the application by OPS, the manufacturer has not been notified to the contrary, he may put into effect his proposed adjusted ceiling prices, but OPS reserves the right to revoke or modify adjustments made under this Regulation at any time.

This General Overriding Regulation No. 10 is referred to as a "break-even" order. For the ice industry, however, as a result of the way OPS is presently interpreting the Regulation, scarcely any potential benefits are available. If an ice company's losses are attributed to its "losses in volume" which is the case in most instances, its request for price adjustment will be denied. Even though the association has interceded for some ice companies that have filed under GOR-10, in every instance thus far OPS has concluded that the information submitted fails to entitle the applicant to price relief because of this "volume loss" factor.

Perhaps some ice companies have or will be able to receive some relief from this order, basing their application for relief on something other than "loss in volume." It is felt, however, that the chances for the industry to derive much benefit from this Regulation are rather remote.

1951 Ice Convention In Lavish Setting

THE 34th annual convention of the National Association of Ice Industries, as announced previously, will be held at the Shamrock Hotel, Houston, leading industrial city of the south, and in one of the nation's finest and most spectacular hotels. Announcement from association headquarters is to the effect that plans are now well under way to present ice men with a 1951 convention program that will match the grandeur and magnificent setting in which it will be held.

This is the first time in twenty years that the ice men of the nation have met in Texas and it promises to be richly remembered by all convention goers. The guest rooms are large and well-lighted by picture windows and the many public rooms are luxuriously appointed. Every room is individually air conditioned and the guest will be able to choose his own climate.

Ice Sculpture Publicizes Ice Industry in Rhode Island

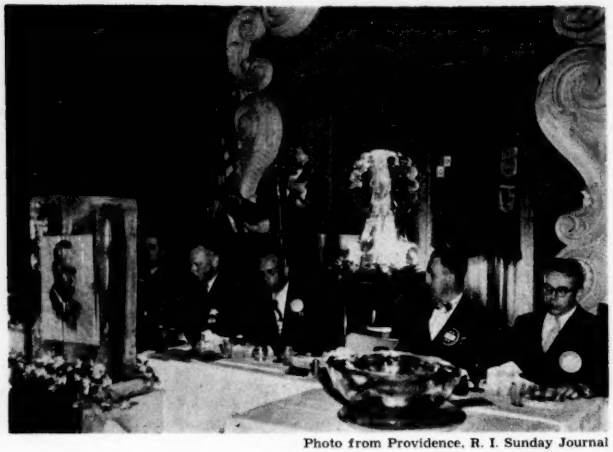


Photo from Providence, R. I. Sunday Journal

Testimonial luncheon to Providence Rotarian Elmer S. Horton is decorated with punch bowl of ice, emblems of ice in background and a block of ice with frozen-in portrait of Mr. Horton who is seated at table, second from left.

Ice Sculpture Publicizes Ice Industry in Rhode Island

AN illustrated feature story in the Sunday magazine section of The Providence, R. I. Journal describes the ice sculpturing work of Robert J. Jordan, employed by the Rhode Island Ice Co. of Providence.

Robert, who is a student at the School of Design, began working with ice figures only a few months ago. He started with a turkey and went on to a small brown bear, a Santa Claus, a K for a Kiwanis party and others. The pieces are used for table decorations for club and private luncheons and dinner parties.

How He Works

Describing his methods of operation, the article says that with two ice picks and a piece of string for compasses, he inscribed a circle at the upper end of one side of the block, the first step in outlining a piece of sculpture. Rapidly he sketched the rest of it, then began roughing it out with an ice pick. He worked with speed and confidence. Soon he was using a stone chisel, pushing it with his hands, not resorting to a mallet.

When he had the piece well along, he slid it into a warm room, where the ice became more transparent, and where he moulded the lines somewhat with his bare hands. In about two hours, the work was done and was returned to the cold room to await the hour of exhibition.

This hour arrived a few days later. From the company's plant were taken two punch bowls of molded ice, a block of ice with gladioli frozen into it and another with a large photograph of Elmer S. Horton frozen into it. Mr. Horton, president of the Providence Rotary Club, was to be honored in this somewhat surprising fashion, at a luncheon at the Sheraton-Biltmore.

The ice display, with three small tables and three pans to drain away the water into containers, was transported to the back door of the hotel, put on a hand truck, wheeled into an elevator, raised, then wheeled into the Garden Room, where the Rotarians were at lunch. The Rotarian table, decorated with pieces of ice, is illustrated above.

Ice sculpture has been a recognized form of art in the ice industry for many years. Recently, through promotion of punch bowls and other decorative pieces of ice, either molded or carved, it has attained new prominence. During the summer of 1951 many similar social affairs will be decorated with ice carvings. .

Ice Lady Makes Big Hit At Florida Tea Dance

THE Decoration Committee of the Ocala (Fla.) Garden Club, composed of Mrs. J. D. (Nancy) Rebstock and Mrs. Loder (Gaye) Patterson decided they wanted to make an unusual arrangement of flowers for a tea dance at the Club House recently. So . . . they called on S. B. Colvard, manager of the Atlantic Ice Plant in Ocala, Fla., and asked if he would assist them.

Ice chippers, wood chisel, hammer, wood scrapers and a 300 pound block of ice was furnished by the Atlantic Ice manager and the housewives, who had majored in art in college but had never tried sculpturing, went to work at the ice plant. The above picture speaks adequately for the result of their efforts.

When completed the glistening lady of their handiwork was moved to a freezer room in the ice plant and kept for 40 hours before being moved to the Garden Club House. The statue was spot-lighted at the dance and stole the show.

All in attendance marveled and admired the cooool lady's beautiful bowl of red geraniums with green ivy, her lovely figure and Mrs. Patterson and Mrs. Rebstocks' ingenious ability.

Mrs. Nancy Rebstock and Mrs. Gaye Patterson admire ice statue prepared for Ocala tea dance.

SELLING ICE AS PEOPLE LIKE IT

How a smart ice distributor utilized a popular demand for ice to serve more people and increase sales. Facing decreased domestic volume, vending stations brought more business.

THIS story begins with the decline of ice sales to homes which have required less and less tonnage since 1946. It is a story of a company founded in 1913 which being faced with the continued drop in domestic ice consumption, did something about it—and fast! Realizing he could not keep production up to plant capacity with domestic users down to one-quarter of their 1946 gross business, John Milton, owner of the Citizens Ice & Fuel Company, St. Paul, Minn., purchased his first Polar ice vending station in June, 1949.

The information in this article comes direct from the records of The Citizens Ice & Fuel Co., Minneapolis-St. Paul, Minn. It shows how a progressive ice company looks at the ice industry and what is required to serve a community on a profitable basis.

Week-end Sales—$500.00

On the Fourth of July week-end, four weeks after the first vending station was in operation, a total of $500 worth of cube and block ice was sold through this station. Contributing factors to the sales volume were, of course, location, warm weather, and holiday traffic.

Selecting Locations

A number of factors were taken into consideration when selecting the locations of the eight vending machines now in operation. The many lakes around St. Paul that offer fishing and picnic facilities dictated the location of several vendors where fishermen and picnickers could pick up ice on their way to the lakes. Thus, major through streets leading to the lakes were chosen to get this trade.

Another station was located in a natural trading area where all the homes are relatively new and all have electric refrigerators. This machine serves customers within a radius of three miles and vends cubes only. One of the best selling stations is located on the corner of a parking lot with a grocery store, restaurant, and tavern at the other end of the block and a bait store diagonally across the street.

Some locations may be very desirable from the standpoint of traffic, trading area, and population but if the cost and terms of a ground lease are not in keeping with expected revenue, they must be eliminated. Five-year leases are preferable to three or one year terms, and a rental of $20 per month is the maximum that should be considered.

Selecting Equipment

Vending stations are self-contained units which must be designed and built to withstand all kinds of weather conditions with a minimum amount of upkeep and remain attractive to draw customers. The useful life of the station should be well over ten years to assure a profitable capital investment.

Stations should have some distinctive characteristic to acquaint people with the ice company and the service offered through vending equipment. The company name is not as important to the public as is the product offered. This is particularly true when appealing to motorists because any sign must "tell all" in a very few words or by illustration which will transmit the message at a glance.

The mechanical equipment should be well designed and as near foolproof as possible because the vending station is expected to perform automatically and render perfect service to each customer. It also must hold the product in perfect condition prior to vending, therefore the refrigerating machine and cooling system used must be completely automatic in maintaining temperatures and defrosting.

Keeping Records

Individual records on each vending station are important because changing factors may reflect an increase or decrease in the revenue. If a station shows a decline in sales, it should be relocated, revived with new signs and paint, or possibly changed from vending one type of ice to another more popular type.

One Citizens Ice and Fuel Company vending station equipped to sell cubes only, sold more dollar volume in January and February than any other combination block and cube ice station. This station was in a residential neighborhood on a heavy traffic street.

With ice at 15 cents for 25 pounds, 30 cents for 50 pounds, and cubes at 25 cents for an 8 lb. bag, the gross sales for a twelve-month period showed cube ice as 25 percent of the total and this percentage is increasing.

Mr. Milton estimates that had his nine Polar stations been in operation for a twelve-month period extending through last summer, they would have grossed $23,000. His records show that a station making 15 cent sales cannot show a profit because the processing, bagging, and placing of a bag of cubes in the station, together with administrative costs will approximate 11 cents.

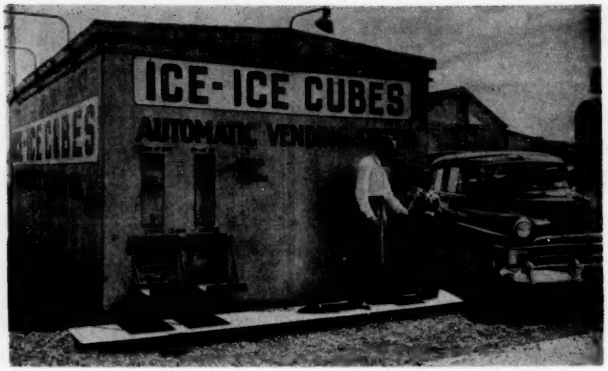
Records should also be kept on the mechanical service of the refrigerating machine and the vending equipment and the maintenance of the station. The ideal arrangement is to have someone within the organization who is capable of making the necessary mechanical repairs or adjustments.

Delivery Equipment and Schedule

Enclosed body trucks are essential for deliveries to the vending stations. The truck can be made more useful and will generally speed up the delivery process if the tail gate is operated hydraulically as a lift. This will permit lowering or raising of block ice to a level with the platform at the station.

Block ice is cut into 25 and 50 lb. pieces at the station and cube ice is bagged at the plant.

A reserve supply of ice should always be stored in the station ready to be placed on the conveyor belts.



One of the eight Polar vending stations installed by Refrigeration Engineering Company for the Citizens Ice and Fuel Co., St. Paul, Minn. This station vends ice cubes, 25 lb and 50 lb blocks.

If the ice or ice bags are dry before being placed on the conveyor belt, they will not freeze to the belt and cause possible failure to deliver at the vending opening.

One man with a truck can take care of six to eight stations (depending on distances between) for the six winter months, then two men are required on week days for the summer months with extra help for week ends.

The men start out about 6:00 a.m. and recheck each station about six times per day. The cool summer of 1950 kept the men busy and it is Mr. Milton's opinion that any prolonged hot weather will make it necessary to put on additional drivers. A hot Fourth of July or other holiday will sell $1000 worth of ice, based on past performance of five stations on July 4, 1949 when $800 worth was sold.

Weather Conditions Strong Factor

Records prove that the cool summer of 1950 reduced the national ice sales to a figure comparable to nine years ago. For a closer comparison, one vending station sold $500 worth of ice in 1949 while the same station on a similar week end sold $166 worth in 1950.

Considerable variation in sales by stations is to be expected; much more so than an ice route. For example one station sold $75 the last week of March and $500 the first week of May. Eight stations sold 16,000 bags of cubes between Christmas and New Year. Sales are definitely affected by the season, weather, and holidays.

Two of the best locations are averaging about $5000 gross each per year. These are on routes taken by fishermen. Another station selling cubes only will gross about $2500.

Comments

Mr. Milton has made a study of the ice vending business and has a number of definite ideas, developed by his experience. The tonnage produced, he says, is of no interest, rather it is the profit on every bit of ice produced that counts. He went on to say that if an ice plant operates for six months and its entire production was sold at a cent per pound, that would make good business. If the weather is hot for a few days this summer, he expects it to be impossible to supply the eight stations with ice fast enough to meet the demand.

Customer relations, he says, is a very important part of the vending business. A machine cannot always be infallible, hence one must be prepared to make refunds and adjustments to the entire satisfaction of the customer. Protecting the interests of the company against tampering, use of slugs, and other irregularities, is another element of this particular phase of the ice business.

American Ice Dividend

AMERICAN Ice Company, New York, has ordered a dividend of $1.50 on the 6 percent non-cumulative preferred, payable July 27 to stock of record July 13. Last year it paid $1.50 each July and September and $3 in December.

Sandusky New Manager Kansas City Ice Companies

L. W. SANDUSKY has been named manager of the City Ice Company, the Kansas City Ice Company and the Southern Ice Company, Kansas City, Mo. The three firms have joint offices at 900 East Twenty-first Street. The new manager also has been elected vice-president of each of the three firms.

Mr. Sandusky came to Kansas City from Dallas, Tex., where he was employed by the Southern Ice Company more than fifteen years. He was manager of the Dallas branch four years. He succeeds Dale E. Culver as manager of the three ice companies. Culver has become the secretary of the American Service Ice Manufacturing Company, 101 West Eleventh Street.

The Southern Ice Company, with headquarters in Kansas City, operates in Kentucky, Virginia, Missouri, Oklahoma, Texas and Arkansas. The Kansas City Ice Company is an ice delivery firm.

Penny Ice Campaign

THE 1951 Penny Ice campaign designed to provide relief from the hot weather for hundreds of needy families has been started by the Kansas City (Mo.) Salvation Army. Ice will be distributed from June 11 until the end of August. Eligible families who wish to receive ice will call at the Army headquarters and receive an identification card. They pay their 78 cents in advance for the summer. For this they receive twenty-five pounds of ice every other day.

Last year ice was distributed to 503 families. The program commenced in Kansas City fifty-eight years ago. The name Penny Ice is taken from the fact that the amount paid by families is only a small fraction of the price of the ice, the remainder of the cost paid for out of public contributions. Proceeds of the Kansas City Penny Ice campaign are used in Kansas City, Independence and North Kansas City. A separate drive is conducted in Kansas City, Kans.

Speeches Now Ready For Local Ice Talks

SPEECHES for use of ice men before local ice groups are now available from the Public Relations Department of the National Association of Ice Industries. These talks, for about 30 minutes, covering the historical development of the ice industry, have been brought up-to-date to cover new developments.

WAR ON ICE INDUSTRY ACCIDENTS

With the coming of hot weather the ice industry reaches its annual peak of production and sales, requiring an influx of inexperienced workers who need training in safety

M. H. SEELIG
Safety Director, City Products Corp.
Chicago, Ill.

THE crystal clear block of ice has an innocent look. Its purpose is to preserve food and refresh jaded palates, yet its career has been marred by accidents to the people who have worked in this industry.

Still, there has been much progress in safety since ice was first harvested from lakes and rivers. In those days men were cut by sharp saws, caught in the jams as blocks were floated ashore, and, not infrequently, drowned. The modern industry, which today makes ice by the process of refrigeration, has eliminated most of the hazards and encourages men to work and drive safely.

Peak Demand

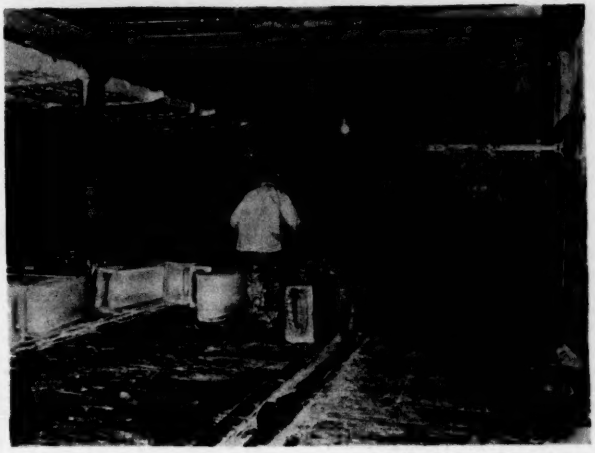
In most sections of the country, with the coming of the first warm weather, the peak demand for ice is quickly reached. Activity begins before plant workers and drivers on delivery routes, even the year-round men, become adjusted to the quickened pace. At that time there is an influx of inexperienced help to be trained in safe ways. Injuries occur, however, before the ice manager has an opportunity to control the situation.

Early Safety Instruction

In its accident prevention work, the industry now appeals to the self interest of an employee directly. The National Safety Council slogan "The Life You Save May Be Your Own" is typical of the ice industry's approach. While rules are established and obedience to them is demanded, the safety objective is reached primarily through teaching, guidance and suggestion. Proper training in the early stages means the difference between a safe worker and one who always will be plagued by injuries. The follow-through to keep men safe rests largely on the supervisor.

Let's take a quick look at the mechanical brains which transform purified water into ice. The key machine in the engine room is the compressor, which compresses the ammonia gas and continues it on the cycle to the condensers where it is cooled and condensed to a liquid. The pressure is then reduced and the liquid changes to a gas in the coils below the floor of the tank room to refrigerate the water in the cans. After the water in the tank cans is frozen they are lifted by crane and carried to a dip tank where the ice is thawed from the cans and dumped on a chute, which takes the blocks to the storage room. The engineers are constantly on guard to discover ammonia leaks in the complicated systems of pipes and valves. An efficient gas mask is always handy near an exit. Belts, shafts and moving parts are protected with guards.

Reprinted from National Safety News, Chicago, Ill.



—Atlantic Coast Line Railroad photo

A block of ice rides the conveyor but still requires manual handling.

Electrical Safety

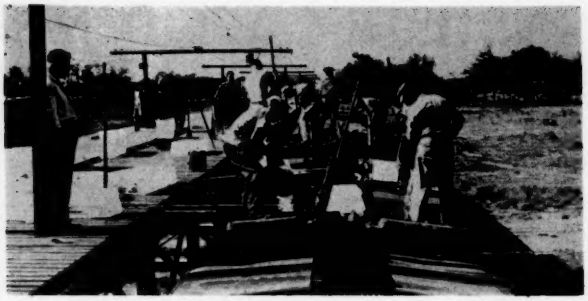
Around the electrical equipment of an ice plant there is always need for great caution. Recently a news dispatch reported that a worker was electrocuted when he touched the live wires of a crane while making repairs. Signs in bright colors on nearby posts and walls warn the operator to "pull the switch before cleaning, adjusting and repairing the machine." If this employee had heeded such a warning he would be alive today.

Hazards of Ice Cake

The innocent block of ice has long been a problem to the safety man. A careful employee will handle ice for years without injury, though his job is far different from an automatic operation such as a punch press or a conveyor line. Ice always must be firmly gripped with tongs and in the right place. Upending or lowering the long, slippery, heavy blocks calls for skill and experience in addition to strength.

A crack in a cake can cause a frozen missile to strike the worker and a loosened grip of the tongs can result in serious injury. The character of the operation requires that the employee stand on a platform or storage floor, seldom free from a coating of ice or chips, and retain his footing, without the usual benefit of a non-slip surface. A rounded edge or a broken corner on the cake can twist it and cause a severe sprain or even a hernia.

Reports of an ice industry study by a well known insurance company show statistically that nearly half of ice accidents occur during the handling of the ice cake itself.



Watching their step must become instinctive to the men who feed the ice into the bunkers of refrigerator cars

During the summer season an ice house is a scene of great activity. Scorers are sawing a two inch cut into the surface of the ice block for future cutting into smaller pieces of accurate weight. On another machine ice is cubed for restaurants, hotels, taverns and home use. Many blocks are crushed for vegetable and fish cases. Despite guards on these processing machines, occasionally someone is injured on a moving saw. Keeping accidents of this type to a minimum requires constant supervision.

On the delivery platform, blocks are lined up ready for loading and are replaced constantly by other blocks sliding out through the storage chutes. Trucks are backed to the docks and drivers pull the blocks over the tailboard or pile bags of cubes into them. Pick-up trucks are most in evidence. Transport trucks carry ice from plant to stations, and tractor-trailers are used for the long-distance hauling.

The job of a driver-salesman is not easy. His route takes him to many kinds of commercial establishments and private homes. He makes frequent trips into basements and upstairs and lifts ice into refrigerators and food cases many times during the day.

Driver Training

As the season gets under way drivers are hired. Time is lacking for the thorough screening and training that leads to the best personnel, but it is to the credit of superintendents and route foremen that even under these "quick-hiring" conditions the safety record of ice fleets is fair. The accident frequency rate is higher than that of bakery and dairy fleets, which operate the year around, but is lower than beverage routes.

Considerable ice goes into the bunkers of refrigerator cars to keep fresh the meat and other perishables on their way from the packing house, fields and orchards to the markets of the nation. Little does the family realize, as it enjoys crisp vegetables or juicy fruit, the long distance these shipments have traveled and the care taken along the route to keep them at protective temperatures.

In railroad icing operations, men on platforms handle large blocks of ice from the conveyor chains. These blocks are cut and skidded over boards to the hatchways of refrigerator cars where men on the narrow runways on top of the cars break the blocks into smaller pieces. Snow ice is often blown on top of the car-

JOE CHECKS TIRES DAILY
JOE KEEPS WINDSHIELD CLEAN
JOE CHECKS GAS, OIL AND WATER EVERY DAY
JOE KEEPS TONGS, ICE BAG OTHER TOOLS IN PROPER PLACE
JOE LOADS TRUCK WITH CARE...KEEPS FLOOR OF BODY CLEAN AND DRY....ALWAYS KEEPS ICE WELL COVERED

This safety poster shows a few of the precautions to be observed in the iceman's routine

go to protect green leaf vegetables en route. On team tracks high-lift trucks raise the ice to the bunkers by means of hoists.

The average icing dock is about 1200 feet long and a man at its farther end is very much on his own. This is also true of the worker in a huge storage and the puller in the immense area of the tank room. It is no easy task for superintendents and foremen to keep all employees safety minded.

General Safety Work

What has been done to overcome the hazards in this industry and improve the safety factor? Graphic National Safety Council posters are distributed throughout the plants. They show the proper way to lift by using the legs instead of the less sturdy back muscles. Other posters warn against jerking and twisting. Company bulletins explain the safe placement of the feet while the block is being raised or lowered. Pictures and bulletins must be augmented constantly by verbal instructions and warnings. The newcomer is not the only one who needs guidance. The old-timer also falls into dangerous habits.

A safety committee is appointed at each plant and plays a most important role. Committee members promote the use of safety shoes; they call attention to the unguarded parts of machines; they ferret out weak railings, unusually slippery spots, loose wires and other plant hazards. On the human side, where 90 percent of all accidents originate, these guardians of safety caution employees against reckless haste. They teach newcomers how to carry their tongs and pikes so as not to endanger themselves and others, and how to work safely while guiding blocks down the chute from the tank room.

In an organization with many plants and delivery stations the safety department reviews numerous accident reports. In particular cases it points out how efficient supervision, better housekeeping, and safer working methods could have prevented the injury. Placed on neat bulletin boards at strategic points, the National Safety Council posters do an effective job among the ice men. These have the specialized touch of the accident prevention artist and an effective economy of words. The illustrations influence men where words, however forceful, sometimes fail.

A "Safety Flash" sent out after a major accident carries a warning in an effective manner. This is on a telegraph form to which has been added a striking masthead, creating unusual attention when placed on the bulletin board. To stress the need of continuous supervision, a frequent letter for the superintendent and the members of his safety committee carries added weight. In this letter we give a topic of discussion to stimulate interest in the next safety meeting. Inserts, with short punchline messages of caution, distributed with pay checks, can be helpful.

Workers Will Have Accidents

In spite of all preventive effort, the workers in ice plants have accidents. Constant effort is necessary to correct the human and mechanical failures that cause them. Hence, a company report features in bold type the questions, "What can be done to prevent a recurrence of this accident?" "What action has been taken?" Witnesses are questioned on the scene. If possible, the injured tells how it happened and the report is written out in the presence of his co-workers. In this way the seriousness of the episode will be impressed on the group and they will not forget soon the lesson the injury has taught.

Safety problems of an ice fleet are only slightly different from those of other delivery systems. There is always plenty of trouble with mechanical defects of trucks, but for the best results we must realize that crankshafts, carburetors or steering gears are not as important as kinks within the human brain. The difference between a safe driver and an unsafe one can account for wrecked equipment, damages to other cars and slowed down deliveries, and a tremendous cost in dollars.

Driver Safety Rules

Every season a placard not smaller than 14 x 11 inches is prepared for the driver's attention. It is a useful repetition of the rules that lead to safe driving. The National Safety Council assists greatly with its traffic posters.

Driving bulletins are issued by the company from time to time. "Rear crashes," "side swiping" "intersection collisions," are some of the topics that are discussed in a constructive manner. They must be brief. Henry Ward Beecher, the great preacher, used to say, "There are no conversions after 20 minutes." And with drivers there is very little reading of safety propaganda past the first 150 words.

In the ice industry, as in other manufacturing fields, a safety program can act as a dam to stop the flow of direct costs such as medical bills, compensation, and liability from truck accidents. Another large expense is the repairs to damaged vehicles.

Many indirect costs arise from accidents — slowed down operations, time out for investigation and reports, inefficiency resulting when key personnel must be replaced, the impaired ability of the plant worker who returns to the job too early. These are some of the items that divert profit dollars into the expense column.

The safety man can help correct the wrong procedures and attitudes that end up in accidents and to create the impulse to work with caution. In any plant where there is "safety mindedness," there exists a spirit of well-being and efficiency. Most industries consider accident prevention a part of good management.

The Ice Industry

Bulletin Gives History of Canadian Ice Company

A BULLETIN has been issued to its employees by Lake Simcoe Ice & Fuel Limited, Toronto, Canada, telling of the beginning 80 years ago of the Spring Water Ice Company, and of its growth through strenuous pioneering days of natural ice harvesting, the building of storehouses on Lake Simcoe, giving the company its present name, the gradual recognition by the public of the economic and sanitary value of ice, and so on to the erection of ice-making plants, the building up of a handsome fleet of motor trucks, the invention of the ice scoring machine, and finally the successful effort to meet the competition of the mechanical refrigerator.

The bulletin points out that personnel, careful training, the use of simple, direct advertising mediums, security benefits to employees, all add up to a record of achievement, backed by graphs showing the steady growth of yearly tonnage sales, and the development of mid-winter business.

Thief Robs Ice Vendor

POLICE of Topeka, Kans., were looking for a pint-sized thief who robbed two automatic ice vendors of $50, gaining access to the machines by crawling into the openings used to dispense 25-lb blocks of ice.

Shrimp Boats Use Tons of Crushed Ice

DIRECTLY alongside the shrimp trawler shipyard at St. Augustine, Fla. are the ice house and boat-icing dock of the St. Augustine Ice Company.

The icing equipment is installed in duplicate and consists of two portable, electrically operated, ice-crusher slingers on the dock, with separate 100 ft. long block ice conveyors extending directly from ice house in rear to the crusher-slingers.

This picture shows velocity with which snow-ice is discharged through nozzle of flexible discharge hose of ice crusher-slinger.

The two conveyors employ a single strand of bar link chain equipped with pusher attachments at suitable intervals.

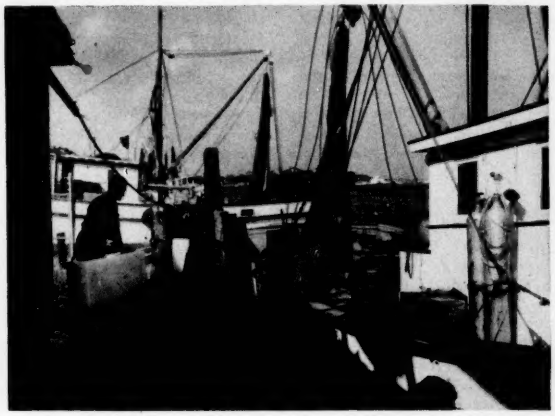
The dock end of each conveyor is driven by a 5 hp electric motor through a flexible coupling; worm gear, 30 to 1 ratio; and precision steel roller chain drive to conveyor head shaft, as illustrated in one of the photographs.

Another picture shows attendant ready to release a 300 lb block of ice to loading ramp and feed-conveyor chains of one of the two No. 440 crusher-slingers.

The discharge end of hose is down in hold or ice storage bin of boat. The boat is the trawler Portugal, into which three tons of "snow-ice" may be discharged in five minutes.

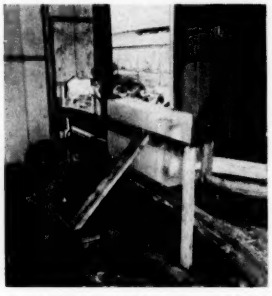
The block of ice is power-conveyed into crusher by the machine's feed chains, and is quickly pulverized by the steel picks which are secured to face of rotating drum.

The snow-ice is discharged at great velocity through nozzle of flexible hose. The shrimp fishing season at St. Augustine usually extends from September to March, and the shrimp dealer-fishermen who own the boats that come to this icing dock are also the stockholder-owners of the St. Augustine Ice Company and its icing dock.



Feeding 300 lb cakes of ice to portable, electrically operated ice crusher-slinger which delivers the resulting snow-ice through the flexible discharge hose to ice storage bins in hull of boat.

The average boat requires 5 tons of snow-ice; 10 tons is the maximum. The amount of ice placed in a boat depends on the distance to be covered and the time the fishermen expect to remain out. Claude H. Mein, manager of the icing plant recalled one day when they handled 192 tons of ice in 24 hours, using both slingers when two boats happened to be at the dock at one time, and that a total of 300 boats had been iced in the previous September to March season.



Dock end of 100 ft long block ice conveyor, showing drive to conveyor head shaft. Ramp to right extends to portable ice crusher-slinger which crushes the cake and delivers snow-ice to ice bins in boat through a flexible discharge hose.

Where and how far the boats have to go to get a boatload of shrimp without too much time out, depends upon where shrimp are known to be most plentiful. Right now, the best territory seems to be down along the Florida Keys to Key West. Boats also go north from St. Augustine as far as Brunswick, Ga. Snow ice, Mr. Mein says, is much better for icing up the boats as it lasts longer and will not freeze together as does lump ice. The snow-ice could be shoveled "even after a week," he said whereas broken ice freezes together and must be crushed again.

The snow ice is hand-shoveled from ice storage bins in boat onto the freshly caught shrimp. A layer of shrimp, a layer of ice, and more shrimp.

Link-Belt crusher-slingers and other equipment is used.

Snow-ice in hold of fishing vessel.

Reports from Unit Ice Associations

Indiana Association Of Ice Industries

ROBERT WALTON, Secy.

THREE district meetings were held during the month of May at Oakland City, New Castle and Lake Wawasee. Ice companies in each section were well represented at these meetings where government controls were the chief topic of discussion. Some time was spent on merchandising ice and ice-using appliances and numerous valuable ideas were shared by neighbor ice men. Due to the splendid acceptance of these district meetings, it is planned that more meetings will be held in Southern, Central and Northern Indiana on a quarterly basis.

During 1950 and 1951 the association has cooperated with Indiana University Department of Distributive Education in two highly successful driver training programs. It has been our intention to continue this most valuable training in 1952, but it now appears that Congressional Appropriation Committees are bent on diverting Federal assistance which made this training possible. Were the Congressional action an economy measure, we would not strenuously oppose them, but it is simply a move to give more money to the Labor Department at the expense of small business. It is virtually impossible for small business concerns to provide their own training program and our University assistance has given us qualified instruction at virtually no cost to the membership of the association.

In the interest of saving this association training program, it is suggested that members write to their senators asking them to oppose the diversion of 10 million dollars of funds used by Distributive Education to another department of the Federal government.

Employment in Indiana continues high in all phases of our economy. Durable goods industries showed appreciable expansions over a year ago. Weekly earnings went to a record high of $71.11 per week. Reactions of Indiana ice companies are that the industry is plagued with severe shortages of labor, which is further aggravated by high wages offered by competing durable goods industries. Ice delivery costs have risen sharply during post war years due to declining markets, increased labor costs, and truck costs.

Georgia Ice Manufacturers Association

BY RICHARD W. FLORRID, Exec. Secy

FOUR forums were held during the months of May and June in Georgia. They were well attended and many splendid ideas were brought up for discussion.

All agreed that in the larger cities and towns, some form of advertising should be done in order to keep the public informed as to the availability of ice, where, when, and what types. With the influx of so many new people to defense areas, they do not know where they can get ice when they need it.

Facts and figures of various surveys show that owners of mechanicals are also customers for ice man's ice if they know where to get it, when they can get it and the types of ice. They are also potential prospects for ice chests and refrigerators.

Mr. Crossfield at Griffin, Ga., reported a novel service, and said he is well pleased with the results. He is offering 5 lbs of sized ice in a 7 lb bag for 10 cents. He advertised this as an ice tea special and it has also increased his sales on the larger bags of sized ice.

Mr. Pitman at McRae, Ga., has instituted a sampling campaign, a bag of sized ice to every mechanical ice box owner in his town to let them see how much better ice man's ice really is.

Several plants with country routes have found that they increased their ice sales by having tea, sugar and even lemons available on their trucks, and some also carried kool-aid.

Vending stations came in for a great deal of discussion and many were of the opinion they were excellent both for the platform and separate individual locations.

Atlantic Company's E-Z Serv stores were discussed and this type of service was agreed by all to be an excellent idea and one that could very profitably be used in any size town. (As a matter of fact we think the idea originated in a very small western town.) This opinion was arrived at by other ice men in the meeting even though Atlantic representatives present had no available information.

Another idea brought out at the Milledgeville meeting was in reference to the trouble with drivers picking up riders and also going off their regular routes. Mr. Hughes, Macon, Georgia, stated they had a case where the driver picked up a rider despite the "no riders" sign on the windshield then went off his route and had an accident. The company held the rider for trespassing and this was upheld in court.

Ohio Association Of Ice Industries

ELIZABETH SHANNON, Acting Secy.

THE ice industry safety campaign for 1951 in Ohio is off to a good start. Most of the companies that reported last year have submitted their reports in the current campaign and several new ones are on the list. Although we are now in the third month of the campaign it is still not too late for those companies which overlooked enrolling to do so at this time. And, if there are any that are in arrears with their reports for the month of May, or even for both April and May, it is not too late for these reports to be submitted.

The safety campaign of the Ohio Ice Industry is now in its fourteenth year and it is our sincere belief that it has been productive of much good, not only to employees who have been saved the discomfort and economic losses due to accidental injury, but also to the employers in building up a favorable accident experience which will eventually reduce premium rates for Workmen's Compensation insurance. Our organized efforts for accident prevention in the ice industry have been going along nicely and we want it to continue that way.

Missouri Zone Meetings

A SERIES of zone meetings to discuss OPS regulations as they apply to the ice industry were held during June by the Missouri Ice Manufacturers Association at Shelbina, Columbia, Independence, Carthage, Rolla, Ste. Genevieve and Sikeston, Missouri.

Eastern States Ice Association Moves

THE office of the Eastern States Ice Association has been moved to 1044 Drexel Avenue, Drexel Hill, Pa., a suburb of Philadelphia. Future meetings of the Executive Committee or the Directors will be held in a Philadelphia hotel. Samuel Freer is secretary-treasurer of the Association.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Elliott Hallowell, Dallas, Tex.
Director, National Association of Practical Refrigerating Engineers

NEWS

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Safety Protection For Refrigeration Equipment

PAUL CASSIDY

Chief Inspector, St. Louis Dept.
The Hartford Steam Boiler Inspection and Insurance Company

Safe operation of refrigerating equipment depends upon careful attention to all factors through installation of reliable equipment, protection against damaging conditions, and careful operation.

Manufacturers codes have been developed to insure safe pressure vessels and equipment when properly used. Good piping and protection with safety devices are essential in the system when it is installed. Careful and competent operators must be employed. Regular inspection and maintenance are the final requirement for good operating results over a long period.

THE first requirement for safe operation of any refrigeration equipment is that it must be built according to sound engineering practice for the job it is to do. We have many cases on record where disastrous explosions or costly failures have occurred because of improper construction. For many years my company actively designed pressure vessels, as well as boilers, in order to provide a "yardstick" of fabrication which would be of a safe standard. Even today we still hear of "Hartford Qualified Welders" although that is now a misnomer.

First Code in 1914

About 1914 the Boiler Code Committee of the American Society of Mechanical Engineers issued the first section of the Boiler Construction Code and it followed that a code for construction of unfired pressure vessels based along similar lines was needed for the standard guidance of industry in building pressure vessels so that hazards due to design, materials and fabrication would be kept to a minimum. The first publication of the Unfired Pressure Vessel Code was issued about 1925. This has been revised, amended and enlarged and at the present time the 1950 edition is coming into wide use for the construction of pressure vessels for refrigerating purposes.

Most states and municipalities having rules or regulations covering the installation and operation of refrigerating equipment have made it mandatory that all pressure vessels forming a part for refrigerating systems over which they take jurisdiction be built in accordance with the A.S.M.E. Code. Further they require the vessel to be stamped and a certified manufacturers data report, signed by the manufacturer and the authorized inspector to be filed with the authorities as bonafide evidence that this requirement has been met. This one requirement alone has already given operators, erectors and inspectors considerable difficulty, probably because of much misunderstanding and because in most cases the installations are about completely installed and ready for service before it is discovered that the receiver, condenser accumulator or other pressure vessels were not built and properly identified by code stamping.

Many manufacturers have their own standard of construction but this is

Presented to the NAPRE Regional Conference, St. Louis

often quite variable and is generally unacceptable by state or municipal authorities. The best and easiest way to be assured that the pressure vessels in refrigerating installations will meet these code requirements is to contract and insist that owner or user of the system be provided with a copy of the manufacturers certified data report on the construction of each pressure vessel. The data report is to be properly signed by the manufacturer and the inspector who made the required shop inspection.

These data sheets might well be compared to the title for an automobile as very few people would consider investing that sum of money required for an automobile today if they were not assured of a clear title to permit the legal registration and operation of that car. All manufacturers, on the proper completion of a pressure vessel, prepare from three to nine or more copies of data reports since the original customer receives at least one while the manufacturer and the authorized inspecting agency keep a copy and in those instances where the pressure vessel is registered with The National Board of Boiler and Pressure Manufacturers, that body requires copies of the manufacturers data report.

Code Provisions

The Unfired Pressure Vessel Code stipulates that the details of the complete design meet with the various applicable paragraphs in this code. Stresses in all pressure parts are limited to certain figures based on the long experience and background of code construction.

But at the same time that limitations are placed on these phases of design, the code endeavors to keep restrictions to that minimum point of necessity without preventing development of new designs and materials by the manufacturer and thereby stopping progress.

After the theoretical design has been carefully checked to see that no important detail has been overlooked and that thicknesses, shapes and all other conditions meet the intent of the code, the actual materials used in fabrication must be properly identified as to material specifications, maker's grade and tensile strength and this must be confirmed by a certified test report executed by the mill for all plates, heads, tubes, etc., except for small and minor parts of the unfired pressure vessel which the fabricator usually carries in stock and for which the mill does not ordinarily provide a mill test report.

The mill test report must contain proper identification such as the heat or slab number for plates, heads and similar parts and the corresponding identifying number must be stamped or stenciled on each plate or head and in all cases where the material is not less than ¼ in. thick, this identifying stamping must be visible on the completed vessel. The mill test report must contain all essential results of physical and chemical properties. These physical and chemical properties are checked by the manufacturer of the vessel and the inspector to see that they do not exceed the requirements for the particular material being used in the fabrication of the vessel.

Material Identification

Very often questions arise as to whether or not a completed pressure vessel can be stamped with the code symbol and a certified manufacturers data report be issued for that vessel. Material requirements alone generally preclude such procedure. Material unidentified by the mill is almost impossible to identify after it leaves the mill and is handled by various jobbers before it finally reaches the pressure vessel fabricator. Such material may or may not be safe and suitable for the conditions under which it was fabricated and under which it will be operated when it is placed in service. Unknown carbon content in steel plate may result in difficult and even dangerous conditions when fusion welding is used in the fabrication of the vessel.

Examination for Inspector

Before an inspector is qualified to inspect pressure vessels in a manufacturer's shop to see that the manufacturer is complying with code rules, he must satisfactorily pass a written examination. His prior experience and education must meet the minimum requirements set up by the various states, municipalities and the National Board of Boiler and Pressure Vessel Inspectors. The code requires that the vessels be examined at certain stages of construction. Welding procedures and welding operators must be properly qualified and test results recorded as evidence that the minimum requirements have been met. Internal inspections must be made, the hydrostatic test satisfactorily completed and code stamping applied in the presence of the inspector. The inspector must be satisfied that the manufacturer has fully met with the intent of the code before he can sign the certificate of shop inspection.

NAPRE Department

Experience Proves Value

There have been many failures which would have been prevented had the objects been designed and built according to code standards. I investigated one such outstanding explosion in Pennsylvania a few years ago. A sweetwater cooler violently blew up in a new dairy products plant. All of the equipment in this plant had been installed new about a year before the failure. One employee was killed and property damage in excess of $17,000 was suffered.

Several official investigations were made of this fatal occurrence and every one was satisfied that both the design and the fusion welded construction were at fault. The manufacturer had built quite a number of these vessels and they were installed in various sections of the country. None of the vessels complied with the code or the State of Pennsylvania Rules. To my knowledge, two similar vessels of this make failed disastrously. The manufacturer investigated the matter thoroughly and was satisfied that design and certain fusion welded fabrication were sub-standard; so, he immediately changed his designs in accordance with the requirements of the A.S.M.E. Code, set up welding procedures, trained welding operators and qualified his procedures and operators as required. I was informed that the non-code sweetwater coolers were then replaced by vessels of code construction.

Piping Systems

Erection of piping in refrigeration systems also presents certain hazards. In the earlier systems where bolted flange joints were generally used, inspection after installation would suffice to ascertain if safe standards were employed. This is not always the case where fusion welded piping is used. A defective and dangerous weld does not always evidence itself from external appearance. A sound weld applied by a good and experienced mechanic is desired of course, and this method of pipe fabrication is now being generally employed for ammonia or other high pressure systems.

While a welder who has demonstrated his ability to make a sound weld by having satisfactorily completed qualification tests, should perform similar welds in his every-day work, we find it very important that proper supervision be provided so that the welder does not become careless, alter materials or methods to

suit some personal likeness or in any other way go too far beyond a reasonable limitation of variables. I believe the adoption of the Pressure Piping Code of the American Standards Association by fabricators and erectors will supply a safe and sound standard of pipe construction acceptable generally without penalizing the customer or the supplier.

Old Equipment

Considerable personal injury or death and much property damage have been caused by violent failures of old vessels in refrigerating systems, some of the failures having occurred to objects only after they have been in operation a great many years. On all questionable fusion welded seams in such old vessels we employ a method of taking out a small sample of the welded seam for examination as to its soundness. This is done by the use of a trepanning saw. A circular section of about 1½ in. diameter is sawed out of the seam being investigated. This section is then cut in two parts so a full cross-section of the weld can be polished and prepared for etching in a boiling solution of hydrochloric acid. This etching will invariably bring out any lack of fusion, slag or gas pocket porosity, lack of penetration and other deficiencies.

The hole in the vessel, if the weld section indicates suitable weld soundness, can be closed by several means. A 1¼ in. steel pipe plug can be threaded into the opening and seal welded, or the hole may be closed by fusion welding a properly prepared plug into the test hole. An investigation of this kind can often be made in a matter of a few hours and I am confident this method has saved at least several lives and considerable property damage in the past.

Repair Methods

Improperly applied repairs to vessels in refrigerating systems have also been a source of failure. Fusion welding especially can contribute to that result when welds are attempted by inexperienced, incompetent or improperly supervised workmen. When repairs are necessary on pressure vessels in refrigerating systems, those repairs should preferably be under the supervision of the manufacturer, a competent and reliable repair shop or an authorized inspecting agency. The National Board of Boiler and Pressure Vessel Inspectors have issued a pamphlet, "Rules for Repairs by Fusion Welding to Boilers and Pressure Vessels."

These rules may be obtained at several sources or directly from the publisher at 145 North High Street, Columbus 15, Ohio. They have generally been adopted by various states and municipalities, some with minor revisions or reservations, and by insurance companies as their standards for fusion welded repairs. Where legal jurisdiction is taken over repairs, the first and most important rule is that the approval of the authorized inspector, state, city or insurance company, be first secured before any repair is started. A record of fusion welded repair is generally required to be filed with the legal authority as evidence that the law has been met. Qualification tests and other requirements of these rules offer no particular problem.

Basic Protection

In order to prevent damage or violent explosions from internal pressure, some positive means must be provided on the system or on each pressure vessel in the system when vessels may be isolated in such a manner that the contents or some other condition may cause the internal pressure to build up to a point in excess of the safe working pressure of the vessel. The most important device for this purpose is the safety valve or relief valve.

The relief valve should be set to open at a pressure within reasonable limits for which the object it is protecting was built. Most legal rules governing the setting of safety valves and relief valves require that they be set at a pressure not to exceed the maximum allowable pressure stamped on the vessel or system the relief valve is protecting. There are instances where it is not practicable to follow this procedure. Where there are no legal restrictions, we do not object to having pressure relieving devices set slightly higher than the maximum safe working pressure of vessels in refrigerating systems.

Ammonia relief valves are of special design and should be given very careful attention. Such valves do not always close tight if opened under service pressure and the resulting escape of ammonia may prove hazardous. In practice, an annual overhauling and testing using compressed air or steam has been found to be satisfactory. Such tests of an ammonia valve may be recorded and a log maintained so that this important check-up will not be overlooked.

The discharge lines of all safety valves or relief valves should be carefully installed and maintained. Ammonia and other hazardous gasses should not be permitted to discharge into an area harmful to human life or food or other products that may be damaged by coming into contact with the gasses. Many municipalities require that the point of escape of the discharge from pressure relieving valves be at a certain distance into the atmosphere. Or arrangements may be provided for the safe absorption of gasses where it is impossible to vent the discharged refrigerant to the atmosphere.

Safety valves on receivers, condensers, accumulators and other pressure vessels are usually installed directly on the vessel without a stop valve between the safety valve and the vessel since most state and municipal laws require such a method of installation. We do not object to the use of a stop valve between the safety valve and the vessel if the stop valve is sealed in the open position. This seal should be examined at regular intervals to see that no unauthorized person has tampered with the seal which might result in the safety valve being shut off from the object it is to protect.

When it becomes necessary to remove a leaking safety valve for repairs a replacement safety valve in proper working condition and set to open at the required pressure must be promptly installed, and the stop valve between the safety valve and the vessel sealed in the open position. A more suitable installation is the use of dual relief valves on a "Y" connection so arranged that when one safety valve is shut off the other safety valve is simultaneously opened to the vessel it is protecting. This provides a very good means for testing and properly maintaining or repairing safety valves in refrigerating systems.

Fusible Plugs

Fusible plugs are often used in certain refrigerating systems as a protective device, especially in systems using Freon and similar refrigerants. These are generally mounted in the ends of the liquid receivers, below the liquid level, and are also used on combination condenser-receivers.

While the principal purpose of the fusible plug is to protect the system against excessive temperature, such as that generated by an unfriendly fire in the locality of the vessel in which the fusible plug is installed, the possibility that plugs might function due to extraordinary working conditions, requires that consideration be given to the melting point. Plugs melting at 200 to 212 F. are

acceptable and are preferable to lower temperatures.

Rupture Discs

Safety discs, some times called rupturing discs, explosion discs or safety heads may be used. The safety disc is not intended, except in some special cases, to replace the spring loaded safety valve or relief valve but in itself is an integral part of the wall of the vessel and any pressure on that wall must also exert its full force upon the rupture member. Upon failure, the safety disc permits a full free opening to relieve the pressure.

The relieving capacities of the safety-discs are the flow capacities of the full pipe without obstruction, which, of course, are much greater than the capacities of safety valves of like diameter. For example, the capacity of a 2 in. diameter rupture disc is something more than three times that of a 2 in. safety valve. However, a safety valve is intended to close when the pressure has been sufficiently reduced; whereas, the entire content of the vessel may be lost following the functioning of the rupture disc. Primarily, the safety disc is intended as an emergency pressure relief, designed to fail at a pressure considerably above the ordinary working pressure. A combination safety disc and safety valve is now available and it has certain advantages over each individual device.

Leaky safety valves are minimized in this manner as the rupture disc is placed between the safety valve seat and the vessel. In the event of overpressure, the safety disc will rupture, permitting the safety valve to then function in the conventional manner and when the pressure has again been lowered to safe limits, the safety valve will shut off and thereby prevent the loss of the entire contents of the vessel or system.

When safety discs are used to protect equipment from overpressure and when there are no legal requirements to the contrary, we do not object to the discs being designed to rupture at a pressure of 50 percent more than the maximum allowable working pressure.

Improper Materials

There have also been a number of serious failures of pipe fittings and vessels where improper materials or materials subject to rapid deterioration have been used in equipment forming a part of a refrigerating system. One common type of this kind is the use of cast iron parts or fittings in brine systems.

The most recent occurrence of that kind on which I am personally familiar happened in the City of Pittsburgh, Pa. somewhat over a year ago. The chief engineer was killed, several other employees badly burned by ammonia and damage to the buildings and foodstuffs was estimated at about $25,000. All details of the explosion could not be learned because of the immediate death of the chief engineer but there is no question that the cast iron vessel was deteriorated and it is also believed that a very rapid and increased change in temperature of the contents caused the failure. Cast iron is not adaptable to sudden changes in temperature and its use in pressure vessels is restricted to somewhat low pressures as well as temperatures.

Corrosion

Our experience record for accidents in refrigerating systems indicates that corrosion is the worst factor. Over two-thirds of our losses have been due to corrosion in various forms. Parts of refrigerating systems most susceptible to corrosion are the condensers, piping containing or submerged in brine, refrigerating piping in cold storage rooms and vessels containing brine. If brine tanks are used they should be drained at intervals so that the refrigerant piping in the tanks can be examined. Control of the brine solution involves the adjustment of the pH value and the addition of chemical inhibitors.

Exposed piping and other portions of refrigerating systems should be given special attention to reduce damage by external corrosion. Protective coatings can do much to keep this action retarded or stopped entirely. The rapid corrosion caused by cooling water in some systems presents a problem, especially in condenser tubes and other heat exchangers. Investigation of the water condition by competent water treatment concerns will do much to avoid costly shut-downs or repairs caused by this action.

The design of refrigerating apparatus, especially pipe and fittings, may be the cause of failures as stresses are invariably set up in making threaded joints and in some cases by improper supports. This condition can to some extent be overcome by using extra-heavy piping and fittings so that, after the threads are cut, there will be sufficient metal left in the piping to withstand the making up of the joints without unduly stressing them. The piping should be properly supported, and the supports should be checked at intervals to determine if they are in satisfactory condition.

Carelessness

The next item causing the larger number of accidents is carelessness on the part of operators of refrigerating systems. Some times this is due to inexperience but more often it is due to "don't care attitude." We have had many instances where workmen drove hand trucks or otherwise bumped or dislodged fittings resulting in extensive damage. In one instance a ½ in. liquid ammonia line was broken by the workman. While it did not cost more than $5.00 to replace this ½ in. pipe nipple, the damage caused by loss of ammonia and the contamination by the ammonia was in excess of $10,000.

Training can do much to avoid these accidents. Again in an eastern city workmen defrosting coils in a cold storage vault containing a large quantity of high grade frozen fruit, as well as many other foodstuffs, caused an ammonia contamination loss greater than $5,000 when they became too careless and struck the ammonia line with their defrosting tools with such violence the properly installed fittings broke.

Another recent accident happened in a storage room containing about $70,000 worth of food products. In that case one of two diffuser units had been segregated from the rest of the system so that it could be defrosted. Shortly after the defrosting had been started, the surge tank forming a part of the diffuser unit failed by tearing along the welded joint. It is evident that the tank contained a large amount of liquid ammonia and, when warm water was sprayed on the coils, the pressure increased to a point where the tank exploded. The tank and other parts of the diffuser unit were not protected against overpressure when isolated. All such surge drums as well as direct expansion milk cooling tanks and ice cream freezers should be protected with relief valves.

Other Troubles

Anhydrous ammonia gas, contrary to general belief, will burn when mixed with air with percentages of ammonia from 11 to 26 percent. Such a mixture is explosive within the range from 13.25 to 26 percent ammonia. Care, therefore, must be used to see that there are no open lights in a room in which ammonia may escape in quantities. Combustion ex-

plosions of ammonia gas have occurred where an electric contact has been broken, thus making an arc, in a room containing an explosive mixture of ammonia gas and air.

Damage to compressors and other machines used in refrigerating systems may not cause as spectacular or as fatal an accident as explosions of the pressure vessels but may be as costly from a financial viewpoint. Proper by-pass relief valves, high-pressure or high-temperature cutouts and also automatic controls to stop these machines in the event of lubrication failure are quite important. Maintenance and competent operation, however, are most important for no automatic device will take the place of a careful and competent attendant.

Maintenance and Inspection

Fusion welding of crankshafts has caused many failures of these shafts. It is our experience that the building up of a crankshaft by fusion welding will invariably set up stresses in the shaft which will ultimately cause failure by stress fatigue. Many such failures fortunately require some time before they occur and often these defects can be discovered by careful inspection especially when it is permissible to use Magnaflux, whitewash or red-dye methods of examination to disclose the existence of the progressive crack. Our experience indicates that fusion welding should never be used to build up or repair these shafts. Metal spray, when properly applied has been satisfactory in building up worn or damaged shaft surfaces.

Disassembled examinations of machines used in refrigerating systems cannot be stressed too strongly. One of the most common failures in ammonia compressors is suction valve breakage. A review of accidents over a period of years shows clearly that, to a large extent, the cause of this trouble is failure to set up a schedule to properly service these valves. Compressor valves should be serviced at least once a year, or in any case, after about 8000 hours of operation.

I believe the foregoing statements bear out the fact that "An ounce of prevention is worth more than a pound of cure" and I would like to leave you with four principal factors which should be observed to assure safe operation of unfired pressure vessels and other components of refrigerating systems:

1—Purchase only from reputable manufacturers and under specifications that will assure the design being in conformity with accepted standards of construction, supplemented by intelligent shop inspection.

2—Entrust the care of refrigerating systems to competent men who thoroughly understand the proper operation of the apparatus and the dangers involved.

3—Install equipment so that all important vessels and other parts are accessible and keep them free from deteriorating influences.

4—Have all pressure parts and vital machines inspected frequently by competent men.

N A P R E
Question Box

H. G. Venemann, Professor of Refrigeration, Purdue University and chairman of NAPRE Educational Committee, answers members operating problems monthly in this column. Send questions to Chairman H. G. Venemann c/o Purdue University, West Lafayette, Indiana.

Removing Ammonia Fumes

Question No. 889: A forced air cooling unit burst open while it was being defrosted with water. A large amount of ammonia was released into the cold storage room where the unit is located. Fortunately the room contained no stored goods.

Several drums of sulfur dioxide were discharged into the room to take up the ammonia fumes and the user reported satisfactory results. It brings up several questions on which I would appreciate answers.

Could sulfur dioxide be used in this manner in a room containing stored goods? Of course the type of goods, packaging and whether it was freezer or cooler commodity would have a bearing.

Is there a better way to rid a room quickly of highly concentrated ammonia fumes?—T.R.D.

ANSWER: This question is similar to question 149 which appeared on page 80 of the 1946 Operating Data Book.

The late A. L. Blatti, formerly chief engineer of the Railways Ice Co., recommended removal of ammonia odors by ventilation with warm air. He suggested that a temporary warm air duct be built along the floor from a warm air region into the room. A ventillating fan set in the duct near the discharge end should provide about one air change per minute.

Slight ammonia odors and other odors such as usually result from new cork construction have been masked by heating brown sugar in a pan to such a temperature that the burnt sugar odor permeates the room. H. T. Haley of Armour & Co. suggested burning sulphur in the room so that sulphur dioxide would combine with the ammonia fumes and be more rapidly removed by ventilation.

The use of sulphur dioxide may be satisfactory in certain cases and dangerous in others. It is true that ammonia gas being a base is neutralized chemically by sulphur dioxide which is acid. However, both gases are poisonous when absorbed by certain foods. The sulphur dioxide will neutralize the free ammonia in the air but it is not likely to neutralize the ammonium hydroxide which will result from any of the gas dissolving in the water content of the food. Apples and other fruits have been spoiled when exposed for several hours to ammonia fumes. Likewise many fruits and vegetables are poisonous when contaminated by sulphur dioxide fumes, grapes being one exception.

It is possible that carbon dioxide either as dry ice or from liquid CO_2 tanks, in connection with rapid ventilation, would neutralize the ammonia gas fumes without doing any damage.—H. V. Venemann.

Safe Defrosting

Question No. 890: In the article by Elmer Johnson on page 25, April ICE AND REFRIGERATION there is discussion of the bursting of a surge drum during defrosting operations with water. Undoubtedly a low side section of this size with accumulator should have a relief valve on it. Other bursting accidents have occurred while defrosting with water. Sometimes it has happened on single units of smaller size where there was no accumulator or surge drum and where a relief valve would not ordinarily be installed.

Will you please tell me how these refrigerating units should be installed to guard against high liquid pressure and resultant bursting of the cooler or its connections when water is turned on for defrosting?—T.R.D.

ANSWER: Section 13 of the A.S.R.E. Safety Code covers this question. In brief it provides for an approved pressure relief device usually a relief valve on each pressure vessel containing liquid refrigerant if said

vessel may be shut off by valves from all other parts of a refrigerating system.

Each pressure vessel shall have the Design Working Pressure stamped thereon if its gross volume exceeds 5 cubic feet.

The important point to remember when defrosting is not to close the outlet valve of the evaporator and to have the compressor in operation to hold the pressure down. Of course the liquid valve to the evaporator should be closed before defrosting but this is not as important as keeping the exit valve open.

More on Question No. 882

In connection with the Safety Code for Mechanical Refrigeration, you have inquired, "Does size of safety valve depend on volume of shell or liquid—Paragraph 13.5?"

Your letter of March 6 addressed to Chairman W. R. Hainsworth of the ASA B-9 Sectional Committee, and the reply by E. T. Benson, Chairman of the Interpretation Subcommittee of the ASA B9.1-1950 Safety Code, were discussed at a recent meeting of the Interpretations Subcommittee held in Detroit.

The Subcommittee has instructed me to advise you further that the size of the relief valve is a function of the projected area of a shell which might be exposed to an unfriendly fire. Thus, the tubes would not reduce the amount of heat admitted to the vessel regardless of what might be the internal volume; and further that this provision in the B-9 Safety Code is similar to that of the ASME Unfired Pressure Vessel Code governing relief devices. The existing provisions of the B-9 Code are in complete agreement with the thinking of the ASME Boiler Code Committee on this same subject.

I hope that this satisfactorily answers your inquiry but if you have any further comments, I am sure the Subcommittee would be very glad to receive them.—M. L. Turpin, Sec'y., Interpretations Subcommittee.

If there is a possibility that some inexperienced man would ever try to defrost an evaporator, or allow a cold accumulator to fill up with liquid with the outlet valves shut, then by all means install relief valves.—H.G.V.

Single Phase Protection

Question No. 891: When one circuit of a three phase motor goes out how much does the amperage increase as the motor operates on a single phase? We recently had an argument in our chapter where some said the thermal overload protection would stop the motor before any damage is done under such single phase operation and others thought it would not. Will the thermal cut outs give full protection? What if the motor is protected by ordinary fuses only, will they stop the motor when it tries to operate on a single phase?—C.N.O.

ANSWER: When one fuse of a three phase motor circuit goes out, the amperage through the single phase circuit will be approximately 1.73 times the original line current. Motors are usually fused and protected with thermal overload for continuous full load operation and for instantaneous starting load.

If the motor is operating on three phase at a light load, it will continue to operate without danger on single phase if the amperage at the 1.73 to 1 ratio is still below the capacity of the other two fuses and the thermal cut out. However on single phase, its speed and its efficiency will be reduced.—H. G. Venemann.

New Questions

Vacuum Check of Overhauled Compressor

Question No. 892: What vacuum reading can be expected on a vertical plate valve compressor after an annual overhaul, and how long should machine run before maximum figure can be reached assuming suction stop valve closed, and 150 lbs. head pressure?

As secretary, I have been asked to contact you on manufacturers' suggestions on probable gauge readings. What should be looked for if readings are not satisfactory?—D.H.B.

Ammonia in Calcium Brine

Question No. 893: A recent analysis of our calcium chloride brine for ammonia shows that it contains:

Free ammonia as ammonium hydroxide—3.26 grains per gallon.

Fixed ammonia as ammonium chloride—77.37 grains per gallon.

What is the procedure for removing this ammonia from the brine?—E.J.K.

Centrifugal Ammonia Compressors

Question No. 894: Since centrifugal compressors have no parts to wear except the main bearings, and have the advantages of staging, why don't the ammonia compressor manufacturers build them in popular sizes from 2 to 25 tons?—M.J.B.

NAPRE Department

Memphis Convention

THIS fall the NAPRE Convention returns to Memphis for the fourth time. The first meeting was held there in 1915 when the organization was broadening its scope and being expanded to full national character. Many of the founding members were in attendance.

The second and third Memphis Conventions followed in 1923 and in 1930. The latter was held in the Peabody Hotel which is again headquarters for the current meeting. Many members will recall that meeting and its program.

One of the speakers was a young Los Angeles engineer, Emmett Quinn who presented his prize winning paper on ice plant operation. Edwin Prestage who had come from England, described his sleeve valve compressor. The recently developed electric eye was demonstrated by Westinghouse Electric Corp. Harry Holbrook gave engineering facts on rebuilding ice plants that have been much used for reference in following years. Dean W. R. Woolrich was already working on food freezing and described his investigations to the convention.

There were also other good papers and discussions, and the convention program produced much of permanent value for the attendants. That is typical of NAPRE conventions and the 1951 meeting will carry the tradition forward.

Professor Venemann has already arranged a broad group of excellent subjects. His committee associates and the officers gave hearty approval to the plans. At a recent conference on these matters he emphasized that in contacts with the speakers he is stressing the desirability of providing material of a directly useful nature to the engineers that make up the membership.

Overseeing general convention matters is Charles Conley, Memphis Chapter Secretary and Past National President. A member since before the first Memphis Convention he knows the game from every angle. He and his associates are expecting large attendance to take advantage of the convenient location and the excellent attractions the convention will offer this year. It is not too early to complete plans now for attending the Memphis Convention, November 6-9.

News Notes and Chapter Activities

Los Angeles

BY FRED HERR

DISCUSSION during the preliminary class, with Henry W. Hawkins of the Hawkins Chemical Company as guest instructor, almost stole the thunder from the main event scheduled for the business session at the meeting of Los Angeles Chapter.

Mr. Hawkins chose as his preliminary class subject a controversial project which aimed to produce fresh water from the ocean and which had recently obtained considerable newspaper publicity in Los Angeles.

Mr. Hawkins first read through a newspaper article which told of the inventor's ways and means of providing the city of Los Angeles with a water supply obtained by a process of distilling the salt from sea water. He then proceeded to take the proposal apart by pointing out the fallacy of attempting any such venture with the inadequate machinery described in the article.

He next called upon Ralph M. Westcott, consulting engineer and a water expert in his own right, for comment. Mr. Westcott explained how the sea water distillation proposal had originally been brought to his attention by the inventor himself but that he had been compelled to reject the plan as impractical from a commercial standpoint.

As explained by Messrs. Hawkins and Westcott, the project involved the use of a kind of magic separator, a blower and various other items of machinery. Westcott drew a plan of the so-called water machine on the blackboard, showing the proposed location of cooling and reheating units, separator blower, etc.

It developed that, if the plan worked at all, the cost of producing an acre foot of water would be about $25, which would make no allowance for depreciation, maintenance, or amortization. By comparison, the Metropolitan Water District of Southern California provides its member cities with untreated water at about $15.00 an acre foot.

The concensus of those present was that the plan was not commercially practical. Herbert N. Royden, former Naval Captain, supplemented this view by explaining that while ships at sea occasionally distill ocean water, and the Army and Navy has done it on some Pacific Islands, the distillation process is out of the question from a commercial standpoint.

President George Paulick presided over the business session. Secretary Don Byl read an announcement of a summer series classes in steam engineering available at the Los Angeles Trade Technical School.

Arthur G. Milburn, Jr., and Ernest Norman were accepted as new members. This brought the number of new members signed to date in the campaign to 24, 9 by the Independent team and 15 by Union Ice-California-Consumers team.

National Membership Chairman Ray Burnett, who also directs the local chapter drive, presented Don Byl with a special prize for bringing in most new members during the past two months. He urged the members to tell all engineers about the new refrigeration course and bring them in to take advantage of it. More prizes are waiting, he said.

Burnett bespoke a little more action in the membership campaign. He explained that he was faced with the prospect of buying a steak dinner at the convention in Memphis for National President Howard Peterson if Los Angeles Chapter fails to top the contest this year. Burnett said that he much preferred to eat that steak at the expense of Mr. Peterson and urged his fellow members to help him bring that about by continuing the membership drive without let-up during July and August when no chapter meetings are held.

A check for $100 was presented by Terminal Refrigerating Company of Los Angeles to the Blair Memorial Fund to help finance the construction of a refrigerating laboratory at the Los Angeles Trade Technical School. It was announced that contributions to this fund can be sent to Treasurer George Paulick, c/o California Consumers Corporation, Los Angeles.

For the educational session, Committee Chairman Dale Rycraft had arranged a panel discussion on "Lubricating Problems in the Engine Room." Robert Savage of Water Chemists, Inc., served as moderator of the discussion. Panel members, chosen for their intimate knowledge of lubricating problems, were: S. E. Brush, lubrication engineer of the Standard Oil Co.; Samuel S. Hansen, president of the Allube Corp.; and Thomas F. Shaffer, lubrication manager, Shell Oil Co.

The chapter's last meeting prior to adjourning for two months was scheduled in the form of the annual Old Timers Night. Invitations were sent to all present members as well as to former members who, by virtue of long connection with the association, qualified as old timers. Ed. L. Nelson's entertainment committee provided a preview of some of the acts that will entertain at the annual Jamboree on November 7.

The first N.A.P.R.E. handicap golf tournament sponsored by the chapter took place at the Municipal Golf Course in Montebello, Calif., Sunday, June 24. A total of eighteen members of the chapter participated in the tournament, conducted under the capable direction of Frank Eccleston of the California Consumers Corp. Mr. Eccleston served as chairman of the golf committee and made the bulk of the arrangements. He also served with William Loesch on a two-man handicap committee which decided upon and assigned the handicaps for the players.

First prize went to Eccleston himself. He turned in the low score of 82 for 18 holes, touring the course in 44 going out, and returning in 38. Rudi Kettler (who didn't do so bad himself with an even 90) presented the winner with the Quinn Trophy, a cup which had been donated by Emmett T. Quinn.

The low handicap winner was R. L. Maple, with a gross of 84, which his handicap brought down to 69 net. He also was awarded a loving cup to set on his mantle at home.

Cup No. 3 was awarded to Gregory "Joe" Mai who, while amassing the ponderous score of 125 strokes for 18 holes, had nevertheless gone about his golfing with a vim and vigor and determination that fully qualified him for the "tried the hardest" classification. How much Joe enjoyed winning the cup is shown by his mile-wide smile in the accompanying photograph.

The golfers were served refreshments in the Eccleston manse after the presentation ceremonies were concluded. The response to this initial tournament, Eccleston announced, was so gratifying that the golf play will probably become an annual feature of Los Angeles Chapter's summer sports events hereafter.

Left: Winner of Los Angeles Chapter's golf tournament was Frank Eccleston (right) of the California Consumers Corp., Los Angeles, who turned in the low gross score of 82. Presenting the trophy is Rudi Kettler (1), of Fairbanks, Morse & Co. Right, Herbert N. Royden, Royden Ice Co., Los Angeles, presents Gregory "Joe" Mai with a special prize as the man "who tried the hardest" during the golf tournament. Joe's huge smile attests the fact that he is entirely unconcerned over the 125 score he made during the tournament.

New Orleans

By Leo Vivien

OUR members are not superstitious, but, since our meeting date fell on June 13, we thought it would be better to dispense with educational lectures and have a little party. About 80 members participated in this nice affair arranged and prepared by Entertainment Chairman J. Chaisson and his assistants James Duffy and Benny Triche. We would have liked some of our brothers in other parts of the country where seafood is scarce to have partaken with us the delicious boiled shrimp, crabs, stuffed crabs, beer, soft drinks and hot dogs. Needless to say, a good time was had by all.

At the June 27 meeting Instructor B. Mancuso continued his course on Operation and Maintenance of Refrigeration Plants. Up to the present time Mr. Mancuso had erected the plant from the hole in the ground and charged the system. During the month since our last educational meeting he had the plant running, and it seems that the evaporator coils need defrosting because his subject at the meeting was "Defrosting Evaporator Coils." The lecturer explained when to defrost, what to do or not do when defrosting, defrosting by use of air, water, hot gas, scraping and dusting. The subject was interesting and instructive and much discussion ensued.

We were quite successful in obtaining advertisers for the Operating Data Book. Our few national advertisers came through as usual, plus 42 local advertisers. Fifteen of the local advertisers are new or returned to the fold. We lost a few, however. This wonderful showing would not have been possible without the work and cooperation of members like, L. Howat, M. Mancuso, F. Chase, E. Leclere, R. Frischhertz, L. Girault, M. Bellinger, F. Gillio, A. Wegener, T. O'Connor, R. Tucker, J. Chaisson, and Leo Vivien. Other members helped by giving us the names of prospective advertisers.

Chicago

By E. B. Jones

The new officers of Chicago Chapter are:

President, Ed Garnaas
First Vice President, Douglas Benton
Second Vice President, Frank Bartilotta
Secretary, Jay Watson
Treasurer, A. O. Clementson
Sergeant-at-Arms, Harold Michler

Board of Directors: Leslie Clifford, Chairman, Eugene Rytlewski, A. R. Carlson. Chairman Educational Committee, Leslie Clifford, Chairman Membership Committee, William Tiffin.

The final meeting of the spring season was held at the plant of the Kosmos Ice Co., where the members inspected the equipment and processes. It was the first opportunity some of the newer members had for a real inspection of the older type horizontal machines. The plant contains three of these with large flywheels and long, wide belts to drive them. While these machines are not as spectacular as the old three story verticals they still give an impressive idea of size and capacity. Also the 400 lb. blocks of ice made in the plant bulked rather large to those visitors more used to seeing ice in cubed or prepared form. Operations were explained to the visitors by E. B. Urann, T. C. Madsen and John Neff of Kosmos Ice Co.

St. Louis

By H. B. Suter

AT A recent meeting of the officers consideration was given to the new Refrigeration Course which will have its initial distribution in the fall. Our previous schedule has been based on one meeting per month but after complete consideration of the matter it was recommended that a change be made.

The group felt that the new course would be a great help to the individual members, as well as the chapter. It was recommended that two meetings be held each month: one to be a combination of the regular meeting with the educational course; the second to be a special educational meeting. It was also recommended that a qualified instructor be secured to present the course to the chapter.

Stockton-Modesto

By R. M. Edger

AT OUR last meeting we visited the Modesto Refrigerating Company plant at Modesto. C. C. Berkley, the manager showed us through the plant. This plant has been expanded recently practically doubling the storage area. The engine room also is being expanded to over 1200 tons of refrigeration.

What really took my eye was their atmospheric cooling tower. This tower supplements their water cooling towers. The atmospheric tower is cut in the high pressure line between the compressors and the regular cooling tower. This unit has three 5 hp fans in the bottom of a tank that is open at the top. There is a header that carries the gases over the top of these fans. This forced air tower removes superheat and drops the discharge temperature to five degrees above atmospheric temperature. Then the temperature is low enough so that no scale forms in the condenser tubes thereby making a nice saving in the cost of water treatment along with the time it takes to mix up this treatment. The chapter is grateful to Mr. Berkley for inviting us to visit this plant, and we all enjoyed this trip very much.

Memphis

By Charles Conley

THE members of Memphis Chapter showed their interest in the coming convention by turning out in good number on the evening of July 4 for a discussion of plans and procedures. A number of matters of local arrangement were discussed.

In connection with the convention program it was the concensus that a good coverage of air conditioning subjects should be included as suggested by Professor Venemann. Other subjects on modern ideas and designs in cold storage, food freezing, dairy, brewery and ice plant work were suggested.

At the meeting Joe L. Rosson, maintenance air conditioning engineer, Hotel Peabody was elected to membership.

Pittsburgh

By Otto Knoch

INSTEAD of the regular meeting in June a plant visit was arranged by President James Gallina. We inspected the Continental Can Company operations in their new plant which has just been in operation about a year. Thirty members were in attendance and we were conducted through the plant by R. L. Wortman, Employment Supervisor.

The operations were explained to us as we began at the point where the original sheets of tinplate are stored and followed through to where the finished cans were packed, ready for shipment. Many types of cans for beer, oil and other products are made and all of it is accomplished on automatic machinery.

We were also shown how fuse cans are made for the military force. These cans, however, are all made on a piece work basis and it was interesting to compare the automatic and the hand production operations. This is a large plant covering 17 acres. After the visit a snack was enjoyed in the cafeteria.

Peterson Gets Results

NATIONAL President, Howard Peterson has quite a bit of work to do in connection with the regular duties of his office. Members throughout the country know this because of the frequent communications they receive from him. During his travels around the northwest territory he has also kept membership building in mind. Recently he forwarded applications for membership at large from three men with the Milton (Oregon) Ice and Cold Storage Co. They are: Ned Gatz, superintendent; Thomas G. Collins, first operating engineer; Preston W. McCoy, operating engineer.

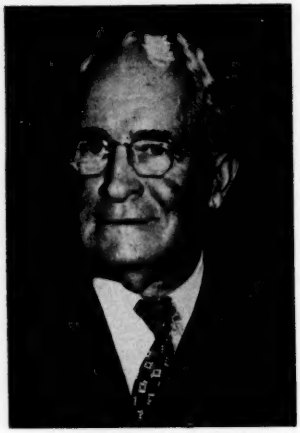
Revised Standard for Steel Butt-Welding Fittings

THE American Society of Mechanical Engineers has published the revised A S A B16.9-1951 standard on steel butt-welding fittings approved April 17, 1951. The standard covers overall dimensions, tolerances and markings for wrought and cast carbon and alloy-steel welding fittings.

NAPRE Department

Harry T. Whyte

AFTER an extended illness Harry T. Whyte died on June 21 in Palo Alto, Calif. A past president of the NAPRE and long one of its most interested and active members, Mr. Whyte had been made an Honorary Member of the association in 1945. At that time he was presented with a Testimonial Book with letters of commendation from the officers and members. Many members of the association owed much of their knowledge of refrigeration and their advancement in the industry to the friendly encouragement and assistance Mr. Whyte gave them.



Harry T. Whyte

Born in Canada in 1875, Mr. Whyte early showed mechanical aptitude and having moved to the United States he began work in that field. Soon he became an electrician on Great Lakes ships and obtained his marine engineer's license. Meanwhile he had begun the study of refrigeration.

On shore he engaged in remodeling of the Aurora, Illinois brewery. The results he obtained brought him other work in the same field and in 1909 he became Superintendent of Plants for Consumers Company, Chicago.

In 1922 the Pacific Fruit Express Company called Mr. Whyte to San Francisco to take charge of their plant operations. After 23 years with the company he retired in 1945. Throughout all these years he was a regular attendant at NAPRE conventions and a very active participant in all its operations. Following his retirement Mr. Whyte maintained active interest in the industry and the association but illness prevented his attending any conventions after 1947.

Membership Contest Gets Up Steam

THE Membership Contest has been considerably enlived by more direct competition. It all started when Chairman Ray Burnett of Los Angeles at the last convention challenged Leo Vivien of New Orleans to a direct chapter contest. These two chapters have been particular rivals for some time but this is the first occasion on which it became wide open. The loser is committed to buy the winner a dinner at the Memphis Convention.

At the present time the statements of both reflect a great deal of confidence and apparently both men are exhorting their associates to back them up. New Orleans started a bit late because they concentrated during the spring period on the Operating Data Book but they have shown that they know how to finish up with quite a rush.

Other individual contests have been arranged between chapters of equivalent size. Detroit and San Francisco are matched. Chairman Arthur Craddick of the Detroit Membership Committee in a recent letter congratulated Ray Burnett on the idea. He continued, "We note our rival club is San Francisco. But, you didn't give us a chance to pick out our own rival, in which case we would have picked on a slow-motion chapter like ours. Probably the only thing that would be worse than pitting us against those wide awake and fast moving fellows in San Francisco would be the grief that would overtake us if we were matched with New Orleans. Those record breaking boys can reverse the flow of the Mississippi if they wish to, simply by a snap of the fingers. However, do not think that we are defeatists for we are good sports and will do our best."

Another contest that should be enthusiastic is between Colton and Stockton-Modesto. This also was announced at the convention when L. G. Schroeder of the former chapter warned Harry Hedburg that they were going to grab the trophy in 1951.

Contests were invited between Fresno and Tacoma, St. Louis and Pittsburgh, Dallas and Chicago, Memphis and Seattle, San Jose and Minnesota and others. Yakima, Tulsa and Rio Grande Valley are in a three way deal. Most of them have been rather reserved in making statements but the membership report shows steady work at many locations. All of them declare that the new Refrigeration Course to be distributed to all members beginning this fall, offers an excellent opportunity for growth.

Mechanically Refrigerated Cars to Carry Milk

MECHANICALLY refrigerated railroad cars will be used for the first time to bring milk to city markets, according to a joint announcement by the Boston & Maine railroad and the Bellows Falls Cooperative Creamery, Bellows Falls, Vt.

An order for Thermo King refrigerating-heating units to equip eleven of the new "reefers," which are much like huge kitchen refrigerators on wheels, has been placed with the U. S. Thermo Control Co., Minneapolis. Delivery is scheduled for May 1, and installation will be made at the Concord, N. H. shops of the Boston & Maine by railroad employees, under the supervision of the Walsh Body and Trailer Corp., Somerville, Mass., New England representatives of U. S. Thermo Control Co.

The cars will be used to haul bottled milk and cream in paper containers from Bellows Falls to Boston, for distribution through First National Stores, at a constant temperature of 35 F. The equipment is completely automatic, and any desired temperature can be maintained by simply setting a dial. The "heat pump" principle, in which the system reverses itself to provide heating if the temperature falls below the dial setting, will keep the milk from freezing during cold weather.

Clark H. Bowen, general manager of the Bellows Falls creamery, said that by use of this method in the refrigeration of milk a great forward step in sanitation and quality control would be achieved, as well as substantial savings in time and money. Each car will have about 16 per cent more cargo space, and the mechanical equipment weighs only 2,500 pounds, compared to a 7,000 pound summer load of ice.

The refrigerating mechanism is a self-contained unit installed at one end of the car, and occupying half the space required by ice bunkers. It consists of a 28 hp gasoline engine, six-cylinder compressor, cooling coil, air circulating fan and automatic controls. Freon is used as the refrigerant. The floor racks and wall flues of the car serve as air ducts. Every five hours the unit defrosts automatically.

One of the most important maintenance features of the Thermo King unit is that it is a complete "package." It can be removed and a replacement installed in about ten minutes.

Selection of a Reciprocating Compressor In Ammonia Refrigeration

C. Y. LEE
Engineering Division,
Wah Chang Corp., New York City

Recently C. Y. Lee a former student of Professor Venemann at Purdue University prepared curves on capacity of vertical and horizontal ammonia compressors in the middle size range. In addition to the usual data, he has added the set of four curves (D) showing the Volumetric Efficiency at the four levels of discharge pressure.

TWO groups of curves are submitted in Figures 1 and 2 to aid in selecting the proper size of reciprocating compressor and motor for a specific load in ammonia refrigeration. Both these figures are compiled from actual tests. Figure 1 applies to vertical single acting, 2 cylinder machines and is based upon 9x9 in. size. The sizes of compressors to which these curves apply are 8x8 in., 9x9 in., 10x10 in., 11x11 in., and 12x12 in.

Figure 2 is for horizontal double acting machines which have a lower volumetric efficiency than the vertical single acting type. However, the modern HDA compressors have about the same performance curves as the VSA machines. These curves are based on 9¼x12 in. machine. These will apply to sizes: 7½x10 in., 11x14 in., 12x17 in., 14x19 in.

There are four groups of curves: A, B, C and D. Each group consists of four curves for four different head pressures. By interpolation, values for other head pressures can also be found.

Group A curves: capacity in T.R. per 100 cfm displacement vs. suction pressure.

Group B curves: motor hp. per 100 cfm displacement vs. suction pressure.

Group C curves: motor hp. per T.R. vs. suction pressure.

Group D curves: volumetric efficiency vs. suction pressure.

Example: Find the proper size of ammonia reciprocating compressor, vertical single acting type, and the required motor horsepower for a 50 ton refrigeration system with a suction pressure of 25 psig and a discharge pressure of 185 psig.

From Figure 1, we found the following values:

26.75 T.R. per 100 cfm
(Curve A-3)
38.75 motor hp. per 100 cfm
(Curve B-3)
1.46 motor hp. per T.R.
(Curve C-3)
82.25 volumetric efficiency
(Curve D-3)

Therefore, for 50 T.R. capacity:

$$\text{Piston displacement} = \frac{50}{26.75}\,100 = 187 \text{ cfm}$$

$$\text{Motor horsepower} = 38.75\,\frac{187}{100} = 73 \text{ hp}$$

use 75 hp motor.

Either one of the following commercial sizes will be satisfactory:

No. of cyl.	In. Bore	In. Stroke	Speed rpm	Piston displacement
2	8	8	400	186 cfm
2	9	9	300	197 cfm

For lower piston speed and a little extra capacity, the 9x9 in. machine will be the choice. In both cases, a 75 hp motor will be required.

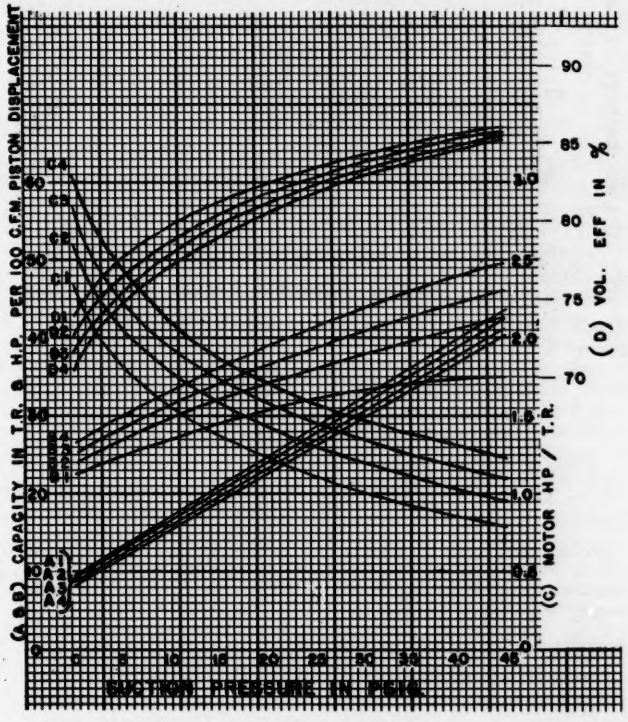


Figure 1—Performance of vertical single acting ammonia compressor

Curves: A: Capacity in Tons Refrigeration
B: Motor Horsepower
C: Motor Horsepower per Ton Refrigeration
D: Volumetric Efficiency in Percent

Curves: 1. Head Pressure = 135.0 psi Gauge (149.7 psia)
2. Head Pressure = 165.0 psi Gauge (179.7 psia)
3. Head Pressure = 185.0 psi Gauge (199.7 psia)
4. Head Pressure = 205.0 psi Gauge (219.7 psia)

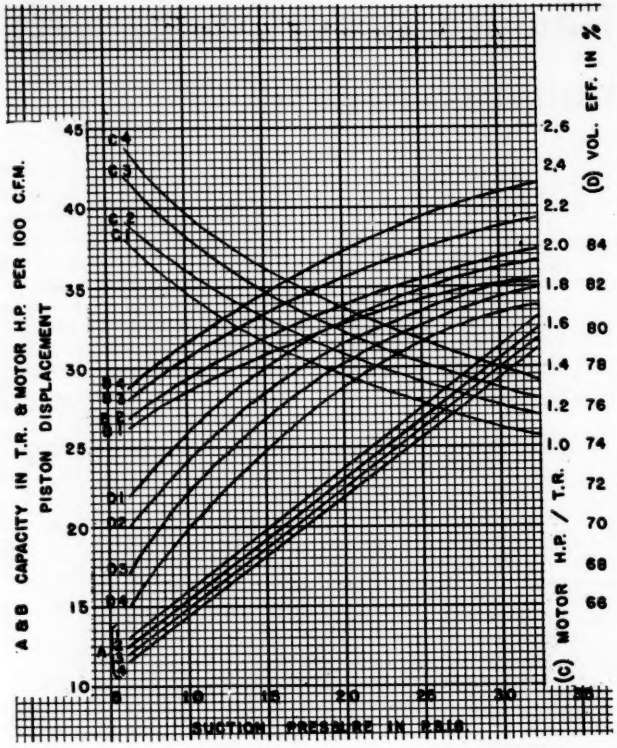


Figure 2—Performance of horizontal double acting ammonia compressor

Curves: A: Capacity in Tons Refrigeration
B: Motor Horsepower
C: Motor Horsepower per Ton of Refrigeration
D: Volumetric Efficiency in Percent

Curves: 1. Head Pressure = 154.5 psig
2. Head Pressure = 168.0 psig
3. Head Pressure = 185.0 psig
4. Head Pressure = 200.0 psig

Although these curves are based on testing data of certain typical size, they are accurate enough for practical purposes for the other sizes given.

Calculations

The actual piston displacement required in cubic feet per minute per ton of refrigeration can be calculated by this formula:

$$\text{DISP.} = \frac{200\ v}{(H_1 - h_2)\ E_v}$$

where DISP=actual piston displacement in cfm per ton of refrigeration,
v=specific volume of vapor entering compressor in cu. ft. per pound,
H_1=heat content of vapor entering compressor,
h_2=total heat of liquid just before the expansion valve,
E_v=volumetric efficiency

Volumetric Efficiency

The volumetric efficiency will be affected by several factors, such as superheat of vapor caused by wire drawing and exposure to hot surface; change in density due to pressure drop in cylinder during suction stroke; leakage in valves; re-expansion of gas in clearance volume; etc. Among these factors, the superheat causes the major drop in efficiency, which can be determined by actual tests. The effect of clearance can be made small by keeping the linear clearance between the piston and cylinder head to a minimum at the end of the stroke.

$$E_c = 1 - c\left\{\left(\frac{p_2}{p_1}\right)^{\frac{1}{n}} - 1\right\}$$

where E_c=volumetric efficiency due to clearance.
p_1=absolute suction pressure in psi.
p_2=absolute discharge pressure in psi.
n=exponent of compression
c=clearance percentage in decimal of cylinder volume.

$E_v = E_s E_c$

where E_s=volumetric efficiency due to superheat.

The volumetric efficiency due to clearance can also be calculated by the following formula[1]:

$$E_c = 1 + c - \left(\frac{v_4}{v_5}\right)c$$

where v_4=specific volume of the vapor entering cylinder.
v_5=specific volume at the end of an isentropic compression.

Motor Horsepower

The motor horsepower required per ton of refrigeration will be related to the compressor design, mechanical and compression efficiency, compression characteristics, conditions of suction gas, etc.

$$\text{Motor hp.} = \frac{H_2 - H_1}{E_m\ E_x}\ \frac{200}{H_1 - h_2}\ \frac{778}{33{,}000} = \frac{4.712}{E_m\ E_x}\ \frac{H_2 - H_1}{H_1 - h_2}$$

where motor hp.=motor horsepower per ton of refrigeration
H_2=heat content of refrigerant leaving compressor in Btu per pound
E_m=mechanical efficiency of compressor and prime mover
E_x=compression efficiency, which is the ratio of theoretical i.hp. to the actual actual i.hp. as obtained from indicator cards.[2]

The E_v or volumetric efficiency of a compressor approximates its E_x or compression efficiency in many cases. E_x is used in this formula, because volumetric efficiency is a factor which controls the weight pumped and the horsepower per ton is independent of the weight pumped as the w appears in both the numerator and denominator.

1. Refer to page 76, "Refrigeration Theory and Application" H. G. Venemann, 1946 edition, published by Nickerson & Collins Co.
2. Refer to page 56, "Refrigeration Theory and Application" H. G. Venemann, 1946 edition, published by Nickerson & Collins Co.

Division of American Warehousemen's Association

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THIS MONTH IN BRIEF

A leading refrigerated warehouseman offers constructive criticism of the industry and tells what should be done to improve the service of storing perishables, especially of frozen foods.

Additional details, with pictures, of the underground cold storage warehouse being constructed near Kansas City. Plans for operation are explained.

A new freezer-storage plant is being erected on the southwest side of Chicago, equipped with all modern fork trucks, all rooms refrigerated with blower type units and ducts distribution.

Studies at the Western Research Laboratory have provided information on the storage stability of dehydrated vegetables.

Cold storage holdings on June 30 showed a 65 percent occupancy of cooler space, a three-point increase over last month; and 73 percent occupancy of freezer space, an increase of one point over last month.

What's Wrong With The Warehousing Business?

A refrigerated warehouseman tells industry members what they should and should not do to provide better relations with stores and shippers, particularly of frozen foods.

H. C. EMERSON
Vice-Pres. and Gen. Mgr.
Cumberland Warehouse Corp.
Bridgeton, N. J.

FOR somewhat over a year we have been charged with the responsibility of taking care of and reporting on deliveries and receipts for a national packer of frozen foods to a large number of refrigerated warehouses scattered all over the United States. This involves the keeping of detailed inventories, records of deliveries to, holdings in, and withdrawals from these various warehouses. The experience has been a novel one to us in acquainting us with the manner in which warehousing is practiced by the other fellow.

H. C. Emerson

Section 21 of Part II of the Uniform Warehouse Receipts Act reads as follows: "Liability For Care of Goods. A warehouseman shall be liable for any loss or injury to the goods caused by his failure to exercise such care in regard to them as a reasonably careful owner of similar goods would exercise, but he shall not be liable, in the absence of an agreement to the contrary, for any loss or injury to the goods which could not have been avoided by the exercise of such care."

Here's an article offering timely, constructive criticism of the refrigerated warehousing industry. The author, Mr. Emerson, occupies a unique position in this field. Successfully in charge of a sizable refrigerated warehousing operation in Bridgeton, New Jersey for several years he is also a "volume storer" of frozen foods. He is an officer of the famed Seabrook Farm organization, and in that connection is in charge of their storage problems which he admits gives him access to the good and bad points of a number of warehouse operations throughout the country, particularly in the Eastern half of the United States. Long a spark plug of the National Association of Refrigerated Warehouses, he is an outstanding member of the association's Executive Committee.

Service Is Inadequate

I call particular attention to the phrase "to exercise such care in regard to them as a reasonably careful owner of similar goods would exercise," and I interpret this to mean to take care of them as though they were your own. I regret to report that in many instances warehouses perform the service of storage of the items at proper temperatures; but beyond that primary function, the service is somewhat inadequate.

When a shipper requests that they desire a warehouse receipt sent to them within twenty-four hours after a carload or truckload has been received at the warehouse, they do not request this just to be ornery; the purpose is so that they may: (1) Notify their customers when, where, and how many products they have which may be disbursed from that location, (2) so that they may have a proper acknowledgement from which to make an inventory entry, or (3) they may want to use the warehouse receipt for financing.

In like manner, when they request that they receive notification of deliveries to customers from stocks stored in various warehouses within twenty-four hours after such delivery is made, the reason they want this notice promptly is (1) so that they may have a proper document from which they can invoice the customer who has made the withdrawal; (2) so that they may make deductions from their inventory records of stocks in that location; and (3) so that they may determine if more merchandise should be shipped to that warehouse.

The packer or storer is entirely dependent upon the warehouseman for notification as to what has been received or shipped and as to date of receivals and shipments. We have found that many warehouses either do not understand the importance of sending through the above information on time, or at all, or else are just lax in performing this type of service for their customer. It has even come to our attention that there was a warehouse that did not know what a warehouse receipt was. This warehouse was not a member of the National Association of Refrigerated Warehouses.

How to Help the Storer

Due to being temporarily on the other side of the picture, the following are some of the things we have found which would be very helpful to the storer, but which in many cases are entirely overlooked: The proper checking and reporting of the contents of incoming loads. Often the items received are listed with insufficient information as to number of packages per case, brand of product, or name of product. This involves a great amount of correspondence both for the shipper and the receiving warehouse, which if the warehouse had properly tabulated the load, would have been entirely unnecessary.

If a truckload or a carload is received short of what the shipping ticket or bill of lading calls for, the shipper greatly appreciates receiving immediate notice of the shortage so that steps may be taken to investigate it promptly. We all know that the longer something of this sort is allowed to go the harder it is to track it down. If there is a shortage or an overage on shipments into the warehouse it is also good practice not only to indicate this on the ordinary receipt, but to write a special note so that particular notice will be taken.

It is also very helpful to the shipper to receive copies of delivery tickets which are ligible. Very often the warehouse sends the third or fourth copy of the delivery ticket to the shipper and due to light writing or poor carbons it is very difficult to make out what is on the ticket.

When an order for shipment has been issued to a warehouse and is subsequently cancelled, it is a source of satisfaction when the warehouse acknowledges receipt of the cancellation notice so that the shipper knows that it has been received.

Uniform Reporting Needed

As to the matter of reporting shipments, we realize that many packers furnish their own forms which have to be filled out in great detail and a number of copies have to be made. This is a problem which should be referred to a joint committee of the National Association of Refrigerated Warehouses and the National Association of Frozen Food Packers to see if a uniform method of reporting could not be worked out which would be satisfactory to all. A form should be devised which at one writing could serve the storer as his receiving or delivery notice and at the same time other copies of this same form could serve the warehouse as a receiving or delivery form for their records.

When business is good and refrigerated space is tight, a warehouse-

(Continued on page 62)

Do's and Dont's for Good Warehousing

Do

Give the customer the service he asks for—and do it with a smile. If it is going to cost you more money to do it his way, tell him so, explain why and he will agree to pay you accordingly.

Walk your receiving and shipping platforms once in a while. Get to know how your people talk to and take care of your customers' representatives. Get to know the representatives yourself. Sometimes they can give you tips on how to improve service that will be helpful from your angle as well as theirs.

Heed the bulletins sent out by the National Association of Refrigerated Warehouses and the Refrigeration Research Foundation. The Staffs of these two organizations are working continually for you. Their bulletins contain practical information gathered from all over the United States giving you up to the minute news on every phase of refrigerated warehousing; including building, operation, maintenance, public relations, and governmental regulations.

Don't

Try to argue a customer out of what he asks for just because it may change your routine. Adjust to fit his needs.

Try to sidestep or gloss over an error or omission. Be the first to admit it and get the jump ahead of any complaint.

Neglect to tell your employees that your customers' business is their bread and butter as well as yours. Hence the work which has to be done for customers should be welcomed and done willingly. If you didn't have any customers—there wouldn't be any work—or any pay checks either.

Underground Cold Storage Warehouse Opens Near Kansas City

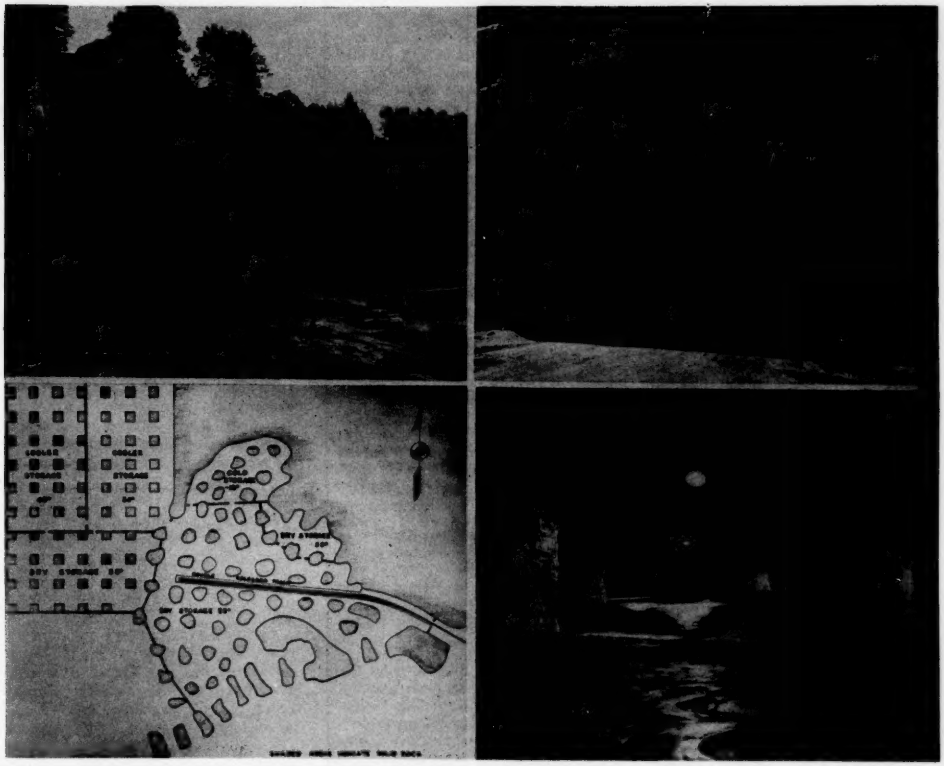
THE Natural Storage Co. Inc., of Kansas City, Kans. now has under construction an underground cold storage warehouse in a limestone mine west of Kansas City. As announced in the July issue of ICE AND REFRIGERATION this storage, starting with 125,000 square feet will eventually have 500,000 square feet of storage space.

The original mine, or cave, was quarried out of the base of a limestone bluff 100 feet high. The average ceiling height inside is approximately 20 feet, thereby leaving some 80 feet of solid limestone above the ceiling. The pillar supports throughout are on an average of from 20 to 35 feet in diameter, and are generally spaced 40 to 50 ft. apart. The floor of the mine is on solid rock but is being slabbed with a four inch concrete floor which will allow unlimited weight loads to be placed on the warehouse floor.

Railroad Spur Tracks

Within the cavern double railroad spurs are being constructed, with the tracks being depressed in a "track well" so that the main floor of the warehouse will be railroad car floor level making it convenient for loading and unloading. Eight outside openings or portals have been constructed which provides railroad, truck, and office docks, thus giving easy access to any portion of the warehouse.

Refrigerating equipment on order consists of Frick complete automatic plant including a Frick ammonia compressor, ammonia receiver, oil separator, high and low cutouts, thermostats, brine cooler, brine pump, 2 ammonia compressors 8x8 inch, each capable of producing 52.4 tons of refrigeration per day; an 8½x8 inch compressor, ammonia receiver, oil ammonia booster, a compressor capable of producing 46 tons of refrigeration per day; 17 Frick air cooling units.



Views of the Natural Storage Company refrigerated plant installed in a limestone mine near Kansas City; showing natural limestone bluff as it appears from the front; the main entrance to storage rooms; layout showing cooler and freezer space; a typical aisle way between the solid rock pillars.

In commenting on the new project, Guy E. Stanley, Jr., president of the Natural Storage Company, explained in detail, plans for operation.

Plans for Operation

The feasibility, of cold and cooler underground storage has been thoroughly tested and proven perfectly satisfactory, through the operation of a similar facility at Atchison, Kans. by the United States Government for the past eight years, Stanley pointed out.

"Through their operating experience," he said, "we have learned that the solid limestone formation provides excellent insulation. The original cool-down period is of considerable duration, and once cooled down, it is very economical to maintain an even, or fixed temperature. The government cave at Atchison contains 7,452,000 cubic feet of warehouse space, and is being maintained, or held at 32 degree to 34 degrees with 205 tons of refrigeration.

Refrigerating Equipment

"Based on this experience," he continued, "it is our opinion that two seventy-ton machines will refrigerate the cooler space with a booster used for the freezer rooms. The refrigeration system that we plan to use is commonly known as the ammonia brine system, the brine being circulated to all parts of the storage space being cooled, and all ammonia being confined entirely in the compressor room, connecting and interconnecting compressors, condensers, receivers, and brine coolers.

"The brine distributing system will be made up of 8 inch main trunk lines with an 8 inch supply and return, so there can be a constant recirculation of the brine, providing uniformly constant temperature of the brine to all parts within the cave. Each trunk line serves a series of coolers with 13½ tons of refrigerating capacity. At the same time large exhaust fans will be installed in the cooler storage so air changes can be made when it is found desirable. or necessary to effect a change of air."

Correction

A NEW wholesale produce warehouse has been completed by the Pure Ice & Cold Storage Co. This company is located at Dallas, Texas and not at Jersey City, N. J., as stated in the June issue of ICE AND REFRIGERATION.

What's Ahead?

Taking a look at the situation in Washington, following the question, "What happens now?" Cold Facts, issued by N.A.R.W. comments as follows:

IT'S pretty certain controls will be continued in some form, but watered down, and probably with the no rollback feature pretty well intact. The peace moves in Korea will undoubtedly have a softening effect on Congress' attitude towards controls. The Administration, with one eye cocked on 1952, fears this and is loudly beating its drums for stronger controls.

There is increasing feeling in some quarters that the current peace moves by Russia are designed to bring about a relaxed defense effort in this country. Another school holds the Reds are merely trying to crawl out from under their blunder while holding themselves up as purveyors of olive branches.

Whatever the reason, we are warned that peace in Korea does not mean a change in the overall, long-range objectives of Joe Stalin and his boys in the Kremlin. Chief Mobilizer Wilson, Economic Stabilizer Johnston and the labor leaders are all playing in the Administration band. Those opposing controls are putting on just as much pressure to have them weakened or eliminated altogether. In the middle is Congress which, if it runs true to form, will probably come up with a controls potpourri calculated to give everybody a little bit of what he wants.

Taxes, too, are in for a Congressional going over. The House has already passed a $7.2 billion tax bill. The Administration boys tell us that we need a $10.8 billion tax increase to drain off excessive purchasing power to stop inflation. These economic jugglers are apparently under the delusion that when our tax dollars are spent by government they somehow lose their inflationary qualities.

With so many obvious opportunities for big economies, we wonder just how necessary any tax increase really is.

Pay-as-you-go is getting kicked around plenty, too. But it's all talk. In spite of a $3½ billion surplus for fiscal 1951 just ended, the treasury is breaking out the red ink for liberal use in fiscal '52.

And so we go, where we're not very sure, taxing, spending, hiring, expanding, experimenting, ordering, and otherwise creating a bigger bureaucratic octopus which is already getting tangled up in its own tentacles.

Storage Life of Meat Frozen in Packages

A REPORT on the storage life of packaged frozen meats has been issued by the Refrigeration Research Foundation, pointing out that the chief factors are package quality, tight sealing properties, storage temperature and humidity.

It warns that wrapped or packaged meat products should be inspected carefully and frequently and if freezer burn becomes apparent the packages should be moved at once. Cut-up packaged meat especially is a highly perishable commodity, the chief causes of deterioration being loss of moisture or freezer burn and oxidation or rancidification.

Manufacturers of packaging materials have improved packaging films, foils, and paperboards during the past few years and have added new types. Wider recognition of the importance of moisture vapor retention and exclusion of air, as well as the importance of other requirements, has stimulated much research on needs of various frozen commodities.

It is quite generally known that lowering the temperature of storage for frozen products lowers the rate at which they will lose weight from loss of moisture and resist decline from attendant or related causes. Thus, to compensate for less adequate packaging, lower temperature (below 0 F) can be used to extend storage life beyond a few weeks or months. For example, studies at Kansas State College a few years ago were made on pork loins, wrapped in cellophane and overwrapped with locker paper, which showed that after 24 weeks, temperatures of –10 and –20 were apparently superior to 0 F. These results indicated a maximum of six months for 0 and two to three months for 10 F. Those studies and others offer an approximation of what can be done with meat products packed in the manner indicated.

If more than a few days, or at most weeks, of hazardous storage life is desired, the package for frozen meats must effectively restrict passage of air and moisture vapor, or else the temperature must be lowered well below O F.

Packaging technology for frozen meats (as for other frozen foods) is advancing rapidly. The chief danger is that the difference between degrees of adequacy in packaging in the sense of protecting the product may not be recognized sufficiently because of emphasis on other desirable package characteristics. Therefore, frequent inspection and gaining of experience and new knowledge are important.

Modern Design Facilities Feature New One-floor Freezer Storage

A new storage for frozen foods is being erected in the industrial district on the southwest side of Chicago. Of modern design, it will have single floor storage areas with one foot platform length for each 150 sq ft of area with the same ratio on the rail side. In addition the truck area will be 90 ft wide, full length to afford rapid in and out movement of vehicles. Many other features are incorporated in the design.

ON THE southwest side of Chicago a large one floor freezer storage is being erected by Continental Freezers of Illinois, Inc. The construction of the building and installation of equipment will be pushed to completion as rapidly as possible and at least a portion of the space is scheduled for operation by November 1. Of one floor construction the new plant will incorporate all design features for rapid efficient storage and handling of commodities.

The overall length of the building is 990 ft. with 190 ft. width in the storage section. The office section on two floors occupies 40 ft. of the length. Enclosed platforms 20 ft. wide run the remaining 950 ft. along both sides of the plant. A 90 ft. wide private trucking area runs the full length of the plant on one side while there is a rail siding all along the opposite side. Forty wide, pull-up doors give quick access for the trucks to utilize the platform.

The machinery room occupies a section at the center of the plant to reduce the length of refrigerant mains to a minimum. There is also an elevated operating office at the center of the plant overlooking the trucking area. This will facilitate direction of traffic into the plant and make operating supervision most convenient.

An inter-communication system will connect to numerous plant stations and the general office. In addition there will be a pneumatic tube system similarly connected. All trucks will enter at the center gate, go as directed to the numbered loading points and leave by the gates at either end.

All goods will be handled on counter-balanced fork trucks. Eight of these trucks are being furnished by Lewis Shepard. The goods will be palletized on the platform and the trucks will carry the loads through air lock openings to stack them in the rooms. It is expected that most goods will be stacked to an 18 ft. height to provide maximum utilization of the floor area.

Storage Facilities

The new plant will have two freezer storage rooms 150 x 340 ft. held at -10 F. Two freezing rooms at -20 F. will be 100 x 150 ft. in dimension. The average clear height in the rooms will be 21 ft. with a minimum of 20 ft. 4 in. The column spacing will be 30 x 33 ft. and the ceiling will be smooth without any beams. Vestibule type entrances with outer and inner doors will provide an air lock. Thermocouples are being installed throughout the plant and connected to a Brown Instrument Division central indicating instrument.

Forced Air Refrigeration

All rooms are refrigerated by blower type units with duct distribution. These are so called floor type units made by Niagara Blower Co., which are suspended just below the ceiling to conserve floor space. Water defrosting is used and a 7½ h.p. pump in the engine room supplies pressure during low pressure periods on the city water supply. Lubricated, plug-type cocks let water into the unit supply pipes. These avoid trouble with freezing of water in the bowl of globe valves.

There are 4 refrigerating units in each of the two -20 F. freezing rooms. The two large -10 F. freezer rooms have 6 refrigeration units in each. The units have generous surface to operate on a small air-to-refrigerant split with high relative humidity.

The machine room at the center of the plant will have primary equipment consisting of three 100 hp FES Fuller Rotary booster compressors. Second stage machines will be four 10½ x 10½ VSA compressors furnished by Baker Refrigeration Corp. All seven compressors will be driven by 100 hp Ideal motors.

Flash inner coolers will be used with liquid ammonia pumps for recirculation of the liquid refrigerant through the coils of the cooling units. The ammonia pumps will be connected to two 44 in. diameter surge drums or accumulators. On the roof is a 400 ton Niagara Evaporative Condenser of special design. Air is circulated through the condenser by two 15 hp propeller type fans. The whole operation of the condenser is under automatic control from head pressure. When the outside temperature drops to about 15 F no water circulates. The condenser water pump is located just below the engine room ceiling for freezing protection. The 7½ hp water circulating pump is in the engine room.

Construction Features

The floor of the plant will be erected about 4 ft above grade on pillars. The sub-floor will be 6 in. reinforced concrete. Insulation will be provided by a 12 in. thickness of Pearlite concrete protected on top by 3 in. concrete working floor. The storage room walls will also have somewhat unusual construction. On the platform sides there will be a concrete block wainscoating running up 6 ft from the platform level. Against this wainscoating will be a 6 in. thickness of corkboard. Then a 6 in. cork self supporting wall rises to the roof level. There will be a waterproof membrane on the outside surface of the cork and it will be finished with the plaster coat. Protection on the inside of the cork walls is provided by 4 x 4 wood studs on 7 ft. centers.

The ceiling construction consists of 4 in thick corkboard laid in the forms. Above this will be the 10 in. reinforced concrete roof slab. Additional insulation will be provided by a 9 in. thickness of Pearlite concrete. Topping this will be a built up roof. The United Cork Companies are furnishing the cork insulation.

General

With buff face brick walls and numerous modern architectural features, the building will have an attractive exterior appearance. A. Epstein & Sons, Inc., Chicago are the architects and engineers. Advisor on refrigeration is Don Parkhurst, chief

engineer of Burge Ice Machine Co. Kenneth F. Stepleton, president of Continental Freezers of Illinois, Inc., is also president of Continental Freezers, Inc., which operates a freezer storage plant at Lafayette, Ind. Stepleton has been engaged in refrigerated warehouse operations in the middle west for some years.

Israel Increases Cold Storage Facilities

PLANS of the Israel Government to quadruple the country's cold-storage facilities by the end of 1953 offer good prospects for private foreign investors, according to Economic Horizons, monthly publication of the Economic Department of the Jewish Agency for Palestine, New York.

There are at present 33 small and medium-sized cold-storage plants in Israel, providing 2,700,000 cubic feet of refrigerated space with a capacity for 25,000 tons. According to Israel Government estimates, at least 3,675,000 cubic feet of additional cold-storage space, with a capacity of 60,000 tons, will be needed by the end of this year, an increase of 150 percent over the present capacity. This presumes a ratio of five tons, or 530 cubic feet, per 100 inhabitants. By the end of 1953, Israel will require 100,000 tons or 10,590,000 cubic feet of refrigerated space, the article states.

The major existing firms are the Palestine Cold Storage and Supply Company, and Maadan Ltd., with plants at Haifa and Tel Aviv. Special factors govern the size and type of cold-storage facilities located at the ports, especially Haifa, where large amounts of imported foodstuffs arrive and must be stored at once. Centers earmarked for development are Acre, north of Haifa; Migdal Gad, south of Tel Aviv; and Elath on the Gulf of Aqaba.

Detailed information as to capital requirements, availability of sites, technical information and operating data are available to interested parties at the Economic Department of the Jewish Agency, 16 East 66 Street, New York 21, N. Y.

Terminal Dividend

THE Terminal Refrigerating and Warehousing Corp., Washington, D. C. has declared a semi-annual dividend of $1.50 payable June 30 to stockholders of record June 22. This is the 151st consecutive dividend paid by this company.

The Storage of Dehydrated Vegetables

R. R. LEGAULT, CARL E. HENDEL and WILLIAM F. TALBURT

Western Research Laboratory
Albany, Calif.

COMPREHENSIVE studies at the Western Regional Research Laboratory have provided information on a number of factors involved in storage stability of dehydrated vegetables, including white potato, sweet potato, cabbage, carrot, beet and onion. It has been found that a substantial degree of protection against nonenzymatic browning (that is, browning in products that have been blanched to inactivate enzymes) is possible by combination of sulfite treatment and low moisture content. In addition, researchers have evaluated use of storage atmospheres low in oxygen content and also a method of continued drying in packaged products which achieves further reduction of moisture content.

This drying method, known as "in-package desiccation", consists of packing a drying agent (calcined lime) in the final container with the dehydrated vegetable. The desiccant is held in a moisture-permeable package and continues to remove moisture from the dried vegetable during storage and transportation. Since this desiccation proceeds at ordinary temperatures, the product is not heat damaged and its ability to absorb water is not impaired, as would be true if this moisture reduction were accomplished in conventional commercial equipment.

The importance of dehydrated vegetables has increased greatly as a part of current defense preparations, and civilian markets for certain products—notably dehydrated mashed potato or potato granules—are under consideration by commercial dehydrators. During World War II the Armed Forces had considerable difficulty preventing browning in dehydrated vegetables in areas such as the South Pacific, and it is hoped that further research and development will result in considerably improved quality for dehydrated vegetables used in the future.

Low moisture is especially effective in protecting dehydrated cabbage and onions against browning. Studies have revealed that in-package desiccation increases by 8 to 10 fold the length of time required for a given amount of browning to develop at 100 F. Among dehydrated vegetables these two are particularly susceptible to browning during storage.

For dried potatoes, a combination of moisture reduction from 9.2 to 5.3 percent and treatment with sulfite within Quartermaster - specification limits has increased the time for detectable browning in one lot by about 16-fold. About half of this protection resulted from the lowered moisture content and about half from the sulfite.

In these studies a close relationship between storage temperature and browning was evident. One of the major objectives, of course, is to prepare and process products that can withstand exposure to high temperatures. Browning rates for the various vegetables were increased about 6 to

(Continued on page 62)

Abstract of paper presented at annual meeting of Institute of Food Technologists.

Refrigerated Warehousemen Plan New Orleans Meeting

William Dalton, executive vice-president of the National Association of Refrigerated Warehouses confers with L. A. Kloor, president of the New Orleans Merchandise Warehousemen's Association, and Jay Weil, Jr., convention chairman, on plans for the next N.A.R.W. and A.W.A. annual meeting to be held May 5-8, 1952 in New Orleans.

June 30 Cold Storage Holdings

SIXTY-FIVE percent of public cooler space was reported occupied on June 30, a three point increase over the previous month's occupancy level. On June 30, 1950 coolers were only 60 percent occupied while average occupancy for this time of year was 66 percent. Increased utilization of space was shown in all but the New England, Middle Atlantic, and Mountain Regions. In the remaining areas, increased cooler utilization ranged from 2 to 11 points.

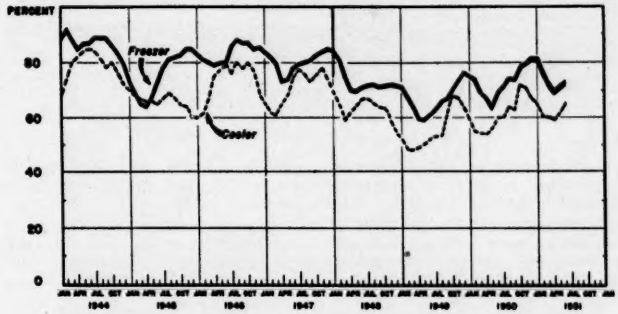
Public freezer occupancy increased two points during June to 73 percent, one point above average for the five-year period ended June 30, 1950 and four points above the occupancy level of a year ago. The East South Central and Mountain Regions were the only areas in which a decrease in freezer space utilization took place. Occupancy of 80 percent or better for both coolers and freezers were reported in the following cities: St. Louis, Cleveland, Baltimore, Norfolk, and Nashville.

National holdings of foodstuffs in refrigerated warehouses totaled 3.2 billion pounds on June 30. Cooler commodities accounted for 1.3 billion pounds of this total. A three percent decrease in cooler weight during June was inconsistent with a six percent increase for the 5-year period ended June 30, 1950 and a five percent increase during June of last year. Cooler items showing a net reduction in weight were fresh apples and pears, canned fruits and vegetables, dried eggs, beef and canned meats.

A net increase of 98 million pounds of freezer-stored commodities brought total freezer weight to 1.9 billion pounds on June 30. This six percent increase over May 31 freezer weight was equal to the average percentage increase for this time of year. Frozen fruits and vegetables, cream, butter, and frozen eggs were the freezer items showing weight increases.

National stores of frozen fruits increased 16 percent during June to 250 million pounds. This increase of 34 million pounds since May 31 compares with an average of 26 and the June 1950 increase of 50 million pounds. Although the seasonal net increase was greater than average, stocks on hand this year were about equal to the June 30 5-year average stocks and they exceeded last year's supply by 15 percent. Only four frozen fruit items, apricots, blackberries, strawberries, Young, Logan, and similar berries, reflected seasonal gains but the cumulative net increase of these items was large enough to counter the net decrease in stocks of the other fruit items.

Frozen vegetables showed seasonal gains in storage stocks during June, but the net gain was not as large as the 5-year average pattern would indicate. By the end of last month, the national frozen vegetable total was 290 million pounds as compared with 270 in store a month earlier. The gain of 20 million pounds during June was almost a fifth less than average but was a third greater than



Occupancy of Public Refrigerated Warehouses 1944-1951

TABLE I—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	June 30, 1951	May 31, 1951	June 30, 1950	Five-year Average
Meat and meat products, lbs.	779,916	839,262	633,160	616,369
Lard and rendered pork fat, lbs.	69,004	68,639	136,258	126,331
Frozen poultry, lbs.	112,161	125,359	122,328	128,346
Creamery butter, lbs.	73,853	42,590	185,167	88,443
American cheese, lbs.	202,012	169,553	229,785	150,299
Other cheese, lbs.	23,830	21,442	19,974	23,383
Shell eggs, cases	2,425	2,083	3,667	5,140
Frozen eggs, lbs.	190,553	162,659	188,476	224,832
Apples, bu.	515	2,844	165	.....
Frozen fruits, lbs.	250,459	216,103	217,255	251,748
Frozen vegetables, lbs.	290,244	270,206	235,955	212,877
Frozen fish, lbs.	126,351	105,944	116,897	103,886

TABLE II—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC COLD STORAGE WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu. ft.)		June 30, 1951 (%)		May 31, 1951 (%)		June 30, 1950 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	3,206	5,697	49	70	50	68	45	64	62	66
Middle Atlantic	33,581	29,805	58	73	59	71	47	66	57	71
East North Central	27,305	24,868	78	77	72	77	75	68	76	71
West North Central	9,985	14,898	70	84	68	84	81	86	78	77
South Atlantic	8,782	6,576	68	80	66	78	66	75	73	77
East South Central	2,580	3,268	83	88	72	89	81	90	83	86
West South Central	6,472	6,568	67	61	65	61	62	59	73	70
Mountain	1,620	2,365	56	58	71	63	65	65	72	73
Pacific	14,956	21,728	53	64	46	54	45	63	50	56
United States	108,487	115,773	65	73	62	71	60	69	66	72

TABLE III—PERCENTAGE OF SPACE OCCUPIED BY PRIVATE AND SEMI-PRIVATE REFRIGERATED WAREHOUSES AND MEAT PACKING PLANTS (APPLE HOUSES EXCLUDED)

	Private and Semi-Private Warehouses						Meat Packing Establishments					
	Net Piling Space (000 Cu. Ft.)		Space Occupied—Per Cent June 30, 1951		May 31, 1951		Net Piling Space (000 Cu. Ft.)		Space Occupied June 30, 1951		May 31, 1951	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	8	21	56	85	50	81	1	..	79	..	..	..
Middle Atlantic	1,178	1,713	50	83	44	80	1,408	258	86	90	86	86
East North Central	6,264	5,599	62	50	59	56	4,142	1,087	87	90	86	88
West North Central	693	2,489	78	60	80	70	12,304	6,091	91	88	91	91
South Atlantic	576	4,218	27	76	22	47	962	239	86	99	86	100
East South Central	....	.....	..	..	..	..	509	119	94	92	91	90
West South Central	275	143	92	99	87	93	1,199	501	99	99	100	100
Mountain	102	41	99	51	99	..	735	437	91	98	87	98
Pacific	2,880	4,073	38	60	35	49	2,662	521	95	90	89	91
United States	11,976	18,297	55	63	53	58	23,982	9,253	91	90	90	91

NOTE:—Blank spaces indicate that insufficient returns were received.

the net increase last year. Item-wise, a greater number of vegetables showed a net decrease during June but the storage gains in stocks of asparagus, green peas, pumpkin and squash, and spinach were greater than the net withdrawals of the other items. Frozen orange juice totaled about 18 million gallons on June 30, an increase of three million since May 31. Other frozen fruit juices increased from 52 million to 56 million pounds during the comparable period.

Stocks of cream were two and a half times greater than last year but about 12 percent below average.

Creamery butter stocks were below average on June 30. With 74 million pounds in storage as compared with 88 million on June 30 for the 5-year period ended 1950, current holdings were about 16 percent below average, but when compared with last year's supply these stocks were only 40 percent as great.

American cheese stores increased to 202 million pounds during June as a result of a net increase of 32 million pounds. While this increase was less than average, total holdings exceeded average June 30 stocks by about a third.

Only about half of the 5-year average June increase in shell egg stocks materialized this year, but it was about equal to the June increase last year. By the end of June, a net into storage of about 300,000 cases brought the national total to 2.4 million cases. When compared with last year, current supplies were only two-thirds as great and were less than half the June 30 average.

Frozen egg supplies increased by greater than average amounts, 28 million vs. 21 million, and totaled 191 million pounds by the end of last month. Yet, stocks were still below average for this time of year.

Frozen poultry withdrawals during June reduced the national stores to 112 million pounds as almost 9 million pounds of turkeys, 2 million pounds of fryers, and a like amount of fowls were withdrawn from storage.

June net withdrawals of beef ,pork and other meat products amounted to 59 million pounds which was greater than average for this time of year. Stocks remaining on hand June 30 totaled 780 million pounds as compared with 633 million in store last year and 616 million in store June 30 during the 5-year period ended 1950.

Beef supplies were reduced 13 million pounds since May 31 and by the end of last month amounted to 87 million pounds. Last year, beef in storage totaled 60 million pounds while the 5-year average supplies were 78 million pounds. Pork stocks were down to 576 million pounds as net withdrawals during June totaled 40 million pounds. By comparison, pork withdrawn during June was more than 70 percent greater than June of last year and 40 percent greater than average.

Lard and rendered pork fat in refrigerated storages showed only slight change from stocks on hand May 31. By the end of last month, the total on hand was 69 million pounds as compared with 68 million in store the previous month. Current holdings were only about half the average June 30 stocks and those of last year.

Stocks of fishery products on hand June 30 totaled 158 million pounds as compared with 142 million last year. During June a net increase of 20 million pounds in stocks of frozen fishery products brought the national total to 126 million pounds. Cured fishery products amounted to 32 million pounds.

Storage Outlook

The upswing in cooler utilization during June may continue into July. On the average, occupancy by the end of July is about a point higher than the level reported June 30. For the past three years, cooler occupancy has never risen more than a point, although during the war years the June seasonal gain was higher. However, during that period shell eggs were moving into storage in greater volume than at present and at this time of year cooler occupancy depends to a large extent upon the volume of case eggs in storage. Should shell egg stocks begin to move from store during June, occupancy by the end of July may be no greater than the June 30 level.

Freezer utilization during June increased as expected, but in an amount less than average. Occupancy should continue on the upward cycle during July and may increase by as much as two points. Much will depend upon the volume of frozen fruits, vegetables, and juices moving into storage. An increase of four points could be expected if the volume of frozen fruits moving into storage continues at above average amounts.

Canadian Holdings of Fruits and Vegetables

THE Dominion Bureau of Statistics of Canada, Agricultural Branch, reports the following commodities held in cold storage on June 1, 1951.

Apples in cold storage on June 1, 1951 amounted to 267,000 bushels compared with 857,000 bushels May 1, 1951 and 144,000 bushels June 1, 1950.

Frozen fruit holdings in storages and factories June 1, 1951 amounted to 10,820,000 pounds as compared with 10,971,000 pounds May 1, 1951 and 7,101,000 pounds June 1, 1950.

Stocks of frozen vegetables in storages and factories on June 1, 1951 amounted to 6,558,000 pounds as compared with 8.185,000 pounds May 1, 1951 and 3,802,000 pounds June 1, 1950.

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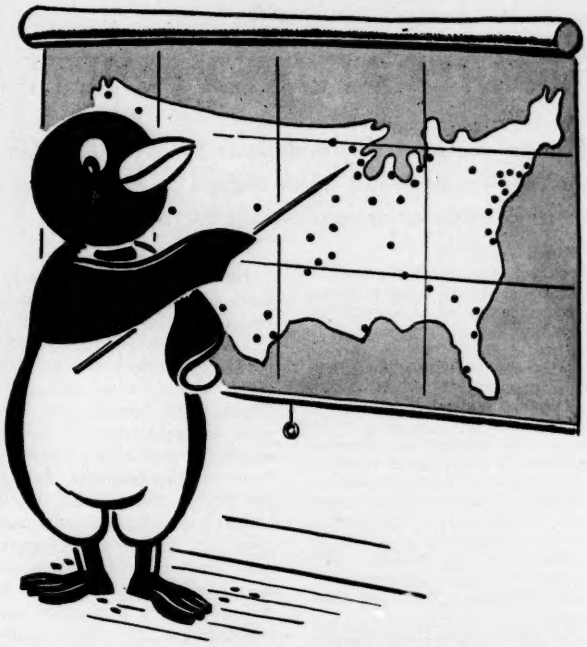

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TEMPERATURES FOR FROZEN FOODS

A major factor in the revolutionizing of the food industry has been frozen foods, which depend on refrigeration, with exacting temperature requirements for best quality.

HAROLD J. HUMPHREY
Research Manager, Birds Eye Division
General Foods Corporation

For many centuries there has been a slow but gradual use of lower and lower temperatures to keep perishable foods edible for longer periods of time. The story opens with the early Greeks and Romans who used snow brought down from the mountains to chill their wines and fresh meats, continues through the use of natural and manufactured ice, and into our present times with mechanical refrigeration which provides controlled low temperatures which are indispensable to production and preservation of high quality frozen foods.

ONE of the indignities suffered by Americans travelling in Europe is that of being forced to drink refreshments at room temperature. To the best of my knowledge, however, none of our "innocents abroad" as Mark Twain once called them—has suffered more than indignity as a result. The temperature at which we consume most of our beverages and many of our foods is merely a matter of custom. Studies of temperature and its effects upon food preservation, however, have convinced us that the temperatures at which we process, store, and transport fresh food products are of extreme importance, and frozen foods are fresh foods.

The control of temperature in the preservation of food has been a major factor in revolutionizing the food industry. But long before the recent dramatic developments in this field, man had discovered the important general relationshp between low temperatures and food preservation.

Sharp Freezing

Sharp freezing, that is to say a procedure of freezing food by placing it in storage rooms held at temperatures below freezing, had its beginning about 1860 when below freezing temperatures were obtained with ice and salt mixtures. Sharp freezer rooms in cold storage warehouses, using mechanical refrigeration and with temperatures in the neighborhood of minus 20 F., were first used about 1908.

In 1916 Dr. Plant, of Germany, demonstrated by means of laboratory experiments, the advantages of the rapid freezing of meat. This was probably the earliest introduction of the time factor in combination with low temperatures to preserve food quality.

Following Dr. Plant's experiments there was a rapid development of quick freezing. Hundreds of patents entitled "Quick Freezing" were issued. Temperatures as low as minus 50 F. and even minus 60 F. were used to quick freeze by contact freezing or by the use of air cooled to these low temperatures.

So from an era in which the value of low temperature had been limited to the preservation of food simply in edible form, we moved into an era in which low temperatures, and rapid freezing enable us not only to keep food edible, but to preserve its original fresh flavor, color, texture, and nutritive value.

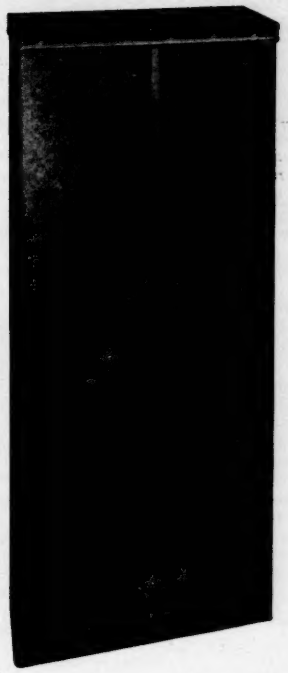
Slow Versus Quick Freezing

Just what is the difference between the slow freezing process and the quick freezing process which is making such far reaching changes in today's food industry? These terms are based on the time required to reach low temperatures, that is zero degrees or below at the center of the product. In slow freezing the time required may vary from several hours up to as much as 72 hours depending on the bulk being frozen, the package used, and the freezing facilities employed. In quick freezing the time may be from as little as 10 minutes up to 100 minutes.

What are the advantages of quick freezing? In certain products, slow freezing results in a product when thawed having a drip or leakage as evidence of some cell or tissue damage. In slow freezing the rate of heat removal is slow and uncertain, since so often uncontrolled. Thus the product at the center of the container deteriorates in quality before the desired low temperature is reached. In quick freezing, however, the rapidity of heat removal preserves all the top qualities of the product.

While the quick freezing process is perhaps the most revolutionary use of temperature in the food industry, temperature is in many other ways important in the production, processing and distribution of quick frozen foods. For instance a definite amount of heat is required to mature each crop that is grown for freezing. Knowledge of temperatures is now being used in planting of the crop to secure a more uniform harvesting—that is to say to secure a spread of harvesting which will avoid an oversupply on any one day. This makes possible a continuous flow of prod-

Paper presented at annual convention of National Association of Frozen Food Packers.



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ucts at their top quality into the freezing plant as well as more rapid handling and better protection from damaging warm temperatures.

Temperatures have also played an important part in the development and phenomenal growth of quick frozen concentrated citrus juices. These products were made possible by the development of high vacuum evaporators operating at low temperatures of evaporation. It has been found that the quality of these products can be lowered by temperatures during storage and distribution above 0 F.

Enzymes and Bacteria

Another important use of temperatures relates to enzymes. Vegetables, like human beings, are composed of living cells and therefore respire. This life process continues after harvesting. Oxygen is taken up and carbon dioxide given off. There is a change in natural sugars. It was necessary to find out by research, first started in 1928, how this could be stopped. This was accomplished by a short heat treatment (on peas, for intance, for 50 seconds), at a high enough temperature to arrest this life process.

Since quick frozen foods are not subjected to high temperatures sufficient to kill all the bacteria, there are, normally, bacterial populations in frozen foods.

Laboratory studies have generally shown, however, that intestinal pathogenic bacteria of the typhoid and salmonella types have a short survival time at 0 F. Jones and Fabian[1], of Michigan State College, in November, 1950 stated, "The effect of low temperatures on microorganisms on fruits and vegetables has been studied by many investigators. It is now well known that the microbial content of these products undergoes considerable change in the process of freezing and subsequent freezing storage, and it is generally agreed that freezing temperatures result in a reduction of the initial microbial load".

Heat used in precooking or preheating frozen vegetables and many precooked frozen foods such as pastry, stews, and chicken a la king, is not sufficient to completely sterilize. This heat is pasteurizing in effect however, and may tend further to reduce microorganism counts. Certain frozen foods such as fruits in syrup or sugar and frozen juice concentrates have substrate conditions unfavorable to the growth of microorganisms of the food poisoning type.

Finally, the diverse nature of bacterial populations in frozen foods is in itself a safeguard. When adverse temperatures occur, the simultaneous growth of the variety of dormant organisms present make the product thoroughly obnoxious to the senses of smell and sight before the toxin can be produced in sufficient amounts to be harmful.

During the many years that these products have been consumed there has been no confirmed evidence of health hazard or ill effects attributable to frozen foods either commercially produced or home frozen. We believe, that the total bacterial populations in frozen foods have no public health significance. However, I am sure this industry will be constantly aware of the esthetic as well as the public health requirements involved and I strongly urge that we produce products with as low a count as possible and see that their storage temperatures are at the low level required to preserve good quality.

Prepackaged Fresh Produce

This brings us to the use of lower temperatures for the temporary preservation of quality in prepackaged fresh produce during the distribution process. While refrigerator cars cooled with ice, have long been in use, the relation of temperature to a temporary preservation of quality did not receive the attention of research workers until the 1940's.

In 1946 Scott and Mahoney[2], of the University of Maryland, reported quality changes in packaged fresh corn and lima beans held at several temperatures between 28 F. and 46 F. Quality held better and longer at the lower temperatures.

Martin[3], research director for the Western Growers Association, in 1947 stated that prepackaged fresh vegetables packaged at the source should be held at not over 38 F. to preserve salability.

In 1947, Hauck and Crawford[4], of the Ohio agricultural experiment station, conducted experiments with both prepackaged and bulk produce held at two temperature levels, namely, at room temperature of 71 F. and at a refrigeration temperature of 39 F. They reported that by far the best results were obtained at the lower temperature.

Showalter, Halsey, and Schomer[5], of the Florida agricultural experiment station, reported in 1949 the conclusion, based on their experiments, that in order to preserve the flavor, color, texture, and composition of prepackaged fresh vegetables rapid precooling was necessary and a holding temperature of 32 to 40 F. until the produce was sold.

In a press release of May, 1950 the United States Department of Agriculture stated that in connection with the distribution of prepackaged perishable produce adequate refrigeration is one of the most important requisites.

The inference could well be drawn from the consistent results of these studies and other similar ones that it lower temperatures are required to reasonably hold the original quality characteristics of fresh produce, the products might better be frozen at low temperatures at the source.

Quick Frozen Temperatures

A number of studies have also been made of the relation of temperature to the preservation of quality in quick frozen products during storage and distribution.

Tressler and DuBois[6], of the New York State agricultural experiment station, reported in 1940, on the basis of their work, the general conclusion that 0 F. is the highest temperature that is satisfactory for the storage of all kinds of frozen foods for extended periods and even lower temperatures are better if prolonged storage is expected.

Woodruff and Shelor[7], of the Georgia experiment station, reported in 1947 on frozen fruits stored at various temperatures from minus 20 F. to plus 10 F. The quality was determined from the appearance, color, aroma, flavor, texture, and leakage.

[1] Jones, A.H. & F. W. Fabrian, 1950. The viability of microorganisms isolated from fruits and vegetables when frozen in different menstrua. Presented before the Food Nutrition and Laboratory Sections, The American Public Health Association. November 2, 1950.

[2] Scott, L.E. & C. H. Mahoney. 1946. Quality changes during the storage of consumer packages of sweet corn and lima beans: Progress Report. Am. Soc. Hort. Sci. Proc. 47: 383-86.

[3] Martin, A. L. 1947. Developments in prepackaged perishable foods. Packaging Service, May, 1947. p. 12-13.

[4] Hauck, C. W. & J. J. Crawford. 1947. Salable life of seven vegetables. Ohio Farm and Home Research, 32: 96-101.

[5] Showalter, R. K., L. H. Halsey, and H. A. Schomer. 1949. Some results of prepackaging vegetables in 1948. Florida State Hort. Soc. Proc. 1948: 154-60.

[6] Tressler, D. K. & C. W. DuBois. 1940. Freezing and storage of foods in freezing cabinets and locker plants. New York State Agr. Exp. Sta. Bul. 690, P. 19-20.

[7] Woodruff, J. G. & Ethyl Shelor. 1947. Effect of freezing storage on strawberries, blackberries, raspberries, and peaches. Food Freezing, 2: 206-7, 223.

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All of the fruits deteriorated more rapidly at a temperature fluctuating from 0 to 10 F. than when held constant at 10 F.

The same investigators[9] reported in 1948 on storage experiments with frozen vegetables and friuts held at various temperatures. They found that when other conditions were constant, the rate at which changes of quality took place was directly related to the temperature of storage with lower temperatures offering the greatest quality protection. Temperatures above 0 F. were found to be unsatisfactory.

Gortner[9], and others, of Cornell University, in 1948 reported on studies with frozen meats, fruits, and vegetables stored at 0 F. and 10 F. and at temperatures alternately fluctuating between 0 and 20 F. Products exposed to fluctuating temperatures dried out within the package and had a dry appearance. There were other quality changes. They concluded that exposure of foods to fluctuating temperatures caused changes similar to those occurring in foods stored at 10 F. Foods stored under both these temperature conditions were definitely inferior to those stored at 0 F.

Larson[10], and others, of the U. S. Department of Agriculture, in 1949 reported that several products, including most vegetables and many fruits, can be held without noticeable change in quality for one or two years at temperatures 0 F. or below. Products held at 10 F. had limited storage life, and they stated that this temperture is not generally desirable.

Longwell[11], of the Missouri agricultural experiment station, reported in 1949 on the effect of storage temperatures on a number of foods held at plus 10 F., 0 F., and minus 10 F. Palatability rating for vegetables was higher for nearly all products when held at 0 and minus 10 F. At these temperatures all vegetables were desirable after 12 months storage. There was no significant difference between products held at 0 F. and minus 10 F.

Hustrulid, Winter, and Nobel[12], of the Minnesota agricultural experiment station, reported in 1949 on green beans, strawberries, beef, and pork stored at a constant 0 F. and at a temperature fluctuating from 0 to minus 10 F. The effects of a fluctuating storage temperature on these frozen foods were not important below 0 F. for color, flavor, texture, and nutritive value when satisfactory packaging materials were used.

Tressler[13], in 1950 pointed out the undesirable changes caused by fluctuating storage temperatures which promote desiccation and cause minute ice crystals to grow larger. Fluctuations of more than a plus or minus 2 F. cause a considerable drip loss and consequent loss of flavor and moisture.

In short, a nonfluctuating temperature at or near 0 F. offers both the best protection of the product's flavor, color, texture, and composition, and the best guarantee of long life.

Proper temperature is important, then, not only for its effect during the freezing process upon the end quality of the product, but in the role it plays in preserving this quality. And this leads us to one of the most important problems facing the frozen foods industry today, namely, the maintenance of suitable temperatures from the original freezing operation through the entire distribution process to the consumer.

Distribution Temperatures

The perfect distribution system would be a low temperature tunnel through which the frozen products could be conveyed from producer to housewife. In practice, however, the procedure that must be used offers many opportunities for damaging temperature changes. At the typical frozen food plant the frozen product is usually stored 48 hours in low temperature cold storage rooms to guarantee that both the product and the shipping containers are down to the proper temperature.

It is then shipped directly by refrigerated truck or super-insulated freight cars to a distributor's warehouse or nearby public cold storage warehouse for holding until shipment to the retailer. Not only should the temperature within the warehouse be watched, but also such practices as placing shipments directly against the wall which may lead to unevenness in temperature. Promptness and efficiency in unloading and transferring shipments from transportation facilities to the warehouse are very important.

The proper use of low temperature cabinets in the retail store must also receive increasing attention. Precautions include adequate insulation and refrigeration, particularly in warmer climates; placement of the cabinet where it will not be affected by warm air drafts, heat from lights, or the heating system; and constant checks on the temperature inside the cabinet.

Tips on Retailing

The National Association of Frozen Food Packers recently issued an excellent brochure entitled, "Tips on Retailing Frozen Foods" which suggests other measures:

Never display frozen foods without the proper zero degree refrigeration.

Never forget that your new deliveries of frozen foods must be immediately placed in your display cabinet or in zero degree storage.

Don't allow frozen foods to stand at room temperatures.

Don't load your cabinet above the safety line. The top packages will not be adequately refrigerated.

These are but a few of the points at which it is especially important to watch for temperature fluctuations. It is a particularly difficult problem for the frozen food industry, however, for while the producer may make periodic quality control checks at various stages of the distribution process his findings must come back to the distributors primarily in education and advices on better and more careful handling.

The frozen foods industry has taken tremendous strides in the development of quick freezing processes, selection of suitable products for quick freezing, and in developing packages which would be moisture proof, low in vapor transmission, leak proof, easily stored and attractive to the housewife. Merchandising presented another and not the least of the industry's problems since housewives were prejudiced against frozen foods which they confused with cold storage products. The development of adequate and economical refrigerated transportation and storage facilities took place from scratch and is now a new industry in itself.

We must not now underestimate the importance to the entire frozen

[9] Woodruff, J. G. & Ethyl Shelor. 1948. Effect of storage temperatures on frozen foods. Refrig. Eng. 56: 514-17.

[9] Gortner, W. A. and others. 1948. Effect of fluctuating storage temperatures on quality of frozen foods. Ind. and Eng. Chem. 40: 1423-26.

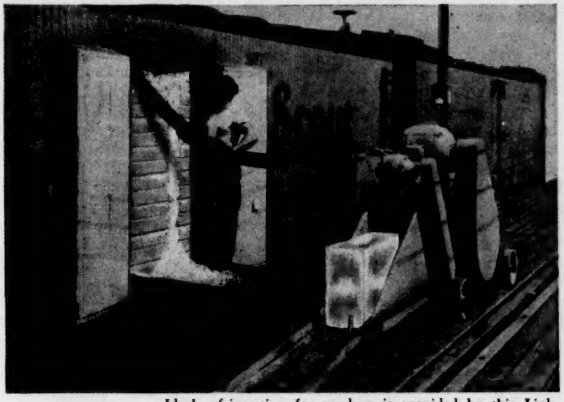
[10] Larson, J. S. & others. 1949. Marketing frozen foods — facilities and methods. U.S.D.A. Production and Marketing Admin. p. 6, 48-49.

[11] Longwell, J. H. 1949. Storage of frozen meats, poultry, eggs, fruits, and vegetables. University of Missouri Agricultral Exp. Sta. Res. Bul. 440. p. 18-27.

[12] Hustrulid, A., Winter, J. D. & Isabel Nobel. 1949. How Do Fluctuating Storage Temperatures Affect Frozen Foods. Refrig. Eng., 57: 38-41.

[13] Tressler, D. K. 1950. Storing Frozen Foods in Domestic Refrigerators. Practical Home Economics 29: 27, 39.

Snow-icing opens new markets for you



Ideal refrigeration for produce is provided by this Link-Belt Ice Crusher-Slinger. For many perishable products, you'll find this low-cost machine a real business-builder.

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LINK-BELT COMPANY: Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

With a LINK-BELT Ice Crusher-Slinger you can give shippers the improved refrigeration they're demanding today

THIS modern method of icing railway cars and trucks will bring you new business.

Perishable items — produce, seafood, meat, bottled milk — reach market in better condition when top-iced with a Link-Belt Ice Crusher-Slinger.

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ICE CRUSHER-SLINGERS

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AMERICAN HAIR AND FELT CO.

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foods industry of maintaining uniform and low temperatures throughout the distribution process, or the importance of industry's role in educating the distributors upon whom it depends so heavily. Years of technical research have developed products near perfection in quality. A broad market for their consumption has been painstakingly developed. The results of this research and investment may lose much of their value if, in that last link which connects producers and consumers, the distribution process, the product quality is allowed to deteriorate due merely to misinformation or carelessness.

We believe that the frozen foods industry will continue to grow and will become an increasingly important influence on American eating habits. We believe that the industry's important and healthful contribution to the foods we eat has only begun. I believe I may speak for the frozen foods processors when I say that we will do our best to continue to improve frozen food products. Further than this we will welcome the opportunity to cooperate with our distributors in making certain that our top quality products reach the American public in top quality condition.

Tests Show Improved Method of Glazing Fish

THE glazing of fish by the usual method when prepared for storage in locker plants has been reported to be very expensive from the standpoint of both time and labor. The extra handling involved in applying the glaze is also an inconvenience to the operators. For this reason, the glaze is very often omitted.

Although the need for a glaze on properly wrapped fish to be held for relatively short storage periods is questionable, it does have advantages when the fish are stored for extended periods, particularly for fish which because of their shape cannot be tightly wrapped. Possibly if glazing could be simplified to some extent, it would be practiced more widely by locker operators.

The usual means of glazing requires waiting for the fish to freeze, then dipping in cold water several times to form a glaze, and packaging. A method has been suggested by a west coast locker plant operator which overcomes this extra handling and inconvenience. The unfrozen fish are first wrapped in vegetable parchment, the package is then soaked in cold water for a few seconds, and is immediately wrapped in moisture-vapor-proof material. It was claimed that much of the water is retained within the package which upon freezing forms a rather heavy glaze around the fish.

In tests conducted by the Fish and Wildlife Service of the Department of Commerce, it was learned that wrapping the fish in vegetable parchment, dipping in cold water, and applying a moisture-vaporproof wrapper over the parchment before freezing, showed a decided advantage in maintaining a glaze over the other methods of preparation used in these tests. Because of the excess water retained by the parchment wrapper, a heavy glaze was formed in the belly cavity and over the entire fish upon being frozen. The need of prior freezing and the extra handling involved in glazing after freezing was eliminated. Also, a close fitting package could be obtained by having the fish in an unfrozen condition at the time the outer moisture-vaporproof wrapping was applied.

Frozen Fruits and Fruit Juices Increase

THE commercial pack of frozen fruits and fruit juices in the United States in 1951 may exceed the record 1950 pack of about 785 million pounds, according to a buluetin issued by the Bureau of Agricultural Economics of the U. S. Department of Agriculture. Large packs again seem likely of strawberries and sour cherries, of which the combined production in 1950 was nearly 300 million pounds or about two-thirds of the total pack of frozen fruits and berries, excluding juice. There probably will be a moderate increase in output of frozen concentrated citrus juices over the record 1950 pack of about 300 million pounds. With the season in Florida nearly completed by mid-June, the 1951 pack of frozen concentrated orange juice in that state was over 270 million pounds (27.5 million gallons), 28 percent larger than in the same part of the preceding season. Increased production in California this summer also seems likely.

Stocks of commercially-frozen fruits and fruit juices in cold storage on May 31, 1951 totaled approximately 400 million pounds, about two-fifths larger than a year earlier. During May, stocks of strawberries increased about 34 million pounds, and orange juice increased about 22 million. Stocks of nearly all other items decreased.

Short Course for Locker Operators

THE sixth frozen food locker operators' short course will be held August 21-23 at University Farm, St. Paul, according to J. O. Christianson, director of agricultural short courses at the University of Minnesota. Sponsoring the short course is the University of Minnesota Department of Agriculture in cooperation with the Minnesota Frozen Food Locker Association, Inc.

During the three-day session, problems to be discussed include ways of increasing processing income per dollar of annual labor cost, meat curing and sausage making, selection of animals for slaughter, sanitation and inspection, maintaining refrigeration equipment at top efficiency and cost accounting. At one of the sessions a demonstration will be given of different grades of carcasses in the cooler.

Research Shows Better Method of Food Freezing

BETTER quick-frozen foods in the future may result from recent research completed by two University of Texas engineers. The two have developed analysis methods to predict more accurately the requirements for quick-freezing a certain fruit, vegetable or meat. The two are Dr. Byron E. Short and Horace E. Staph, mechanical engineering faculty members.

Reseults of their research will be given September 4 in London at the Eighth International Congress of Refrigeration. By studying the removal of heat from each of a foodstuff's constituents, water, sugars, salts and other solids and of other heat phenomena, the researchers devised calculations to determine more accurately what must be done to quick-freeze that foodstuff.

Glycerine Improves Food Freezing Process

THE value of glycerine in improving methods for quick freezing foods is indicated by J. Lomholdt-Pedersen in U. S. Patent 2,529,959. The first step in his process is immersion freezing in a neutral liquid, such as a glycerine-alcohol mixture at about -5 C; the second step is further freezing by low temperature gas or air. According to the patent, the immersion freezing step causes a hard shell to form on the food product, preventing subsequent loss of liquids and juices.

With This NEW Improvement Niagara "No-Frost Method" puts you a big step ahead in trouble-free, automatic refrigeration or freezing

Niagara "No-Frost Method" keeps frost and ice COMPLETELY OUT of your cooling, chilling, freezing or cold storage.

It uses Niagara No-Frost Liquid Spray to keep frost and ice from ever forming. It gives you, automatically, refrigeration with no defrosting, and full capacity NEVER cut down by ice building up progressively on refrigeration coils.

Now, a NEW design No-Frost Liquid concentrator, using a new principle, takes away moisture as fast as it is condensed by evaporating it at low temperature —not boiling it away at high temperature. It has 14 times the capacity of the old method per dollar of investment — one concentrator will handle a battery of high capacity spray coolers.

This gives you more refrigeration at lower cost; less machinery in less space. You operate at high suction pressure, saving power and wear and tear on compressors.

The extra capacity and lower cost both for equipment and operating makes this method advantageous for every type of refrigeration use—both for freezing and for moderate temperatures—for large "live" loads as in meat chilling or in fruit and vegetable precooling — for rooms that are filled and emptied of product daily, such as milk rooms and terminal storage warehouses.

You get true trouble-free refrigeration . . . No brine . . . no salt solution . . . no dirt . . . no mess . . . It is entirely clean; you get rid of dirt and odors. You reduce both equipment and operating costs.

For complete information write to the Niagara Blower Company, Dept. IR, 405 Lexington Avenue, New York 17, New York.

If you need extra capacity . . . the Niagara "No-Frost Method" can help you get it with your present compressor.

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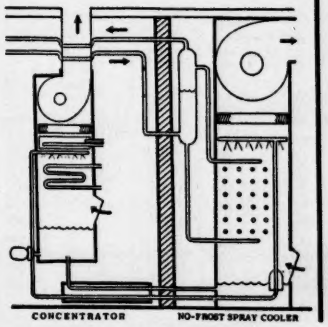
A simple method, easily maintained. Saves a third of your refrigeration cost . . . Ask for Niagara Bulletins 118 and 119.



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You can't take chances on your supply of crushed ice for protecting perishables. A Tri-Pak crusher-slinger will always give you crushed ice anytime . . . anywhere. These units are built in five models, both gasoline and electric powered, to give you the exact capacity you need at the lowest possible cost. Only two operators are required . . . one to slide full-sized blocks of ice into the crusher and the other to direct the slinger nozzle.

All Tri-Pak crusher-slingers are strongly built of welded steel to give you years and years of low-cost service. Rigid "X" frames carry the crusher and slinger and either a husky electric motor or a Ford industrial power unit. You can't match a Tri-Pak crusher-slinger for rugged, efficient operation.

TRI-PAK Machinery Service Inc.

Write today for your TRI-PAK BOOKLET which helps you select the crusher-slinger you need.

HARLINGEN, TEXAS

Shipments of Air Conditioning and Commercial Refrigerating Equipment – 1950

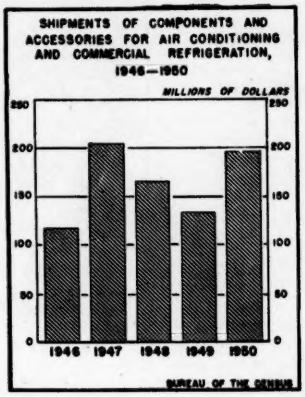
SHIPMENTS of components and accessories for air conditioning and commercial refrigeration equipment in 1950 were valued at $196 million, up 48 percent over 1949 and only slightly below 1947 peak shipments of $204 million according to the Bureau of the Census, U. S. Department of Commerce. This increase in value of shipments was shared by all four major classes of components and accessories for air conditioning and commercial refrigeration equipment included in this report.

Condensing Units

Condensing units showed an increase from $54 million in 1949 to $74 million in 1950, a gain of 39 percent. Compressors and compressor units, valued at $30 million in 1949, increased 57 percent to $47 million in 1950. Centrifugal refrigeration systems were valued at $12 million in 1950, up 50 percent over 1949, and the value of heat-exchanger equipment shipped in 1950 amounted to $62 million, an increase of 52 percent over the preceding year.

Self-Contained Units

Shipments of self-contained air conditioning units amounted to $85 million in 1950, a gain of 68 percent over 1949. The value of shipments of ice-making machines totaled $7 million, up 55 percent over the previous year.



Scope of Service

The figures on quantity and value of shipments in this report represent completed sales of equipment, i.e., units actually billed and shipped. Complete units delivered on consignment or shipped to a branch warehouse for stock are not included until such time as they are actually sold. The dollar values shown are the manufacturers' net billing prices, f.o.b. factory.

This release presents data for virtually every company manufacturing components and accessories for air conditioning and commercial refrigeration and complete air conditioning equipment. The 1950 figures are based on reports received from 98 companies.

Tables

Table I presents a historical summary of the quantity and value of shipments of air conditioning and commercial refrigeration equipment by class of product for the period 1946 through 1950.

Additional tables show the quantity and value of shipments of individual types of air conditioning and commercial refrigeration, except compressors and compressor units, for 1949 and 1950; also data on quantity and value of shipments of compressors and compressor units for 1949 and 1950. For 1950, for the first time in this survey, data is shown on the number of compressor bodies manufactured, a compressor body being defined as the basic compressor casting. This additional data was incorporated to agree with instructions on the reporting forms used in the quarterly surveys conducted by the Air Conditioning and Refrigerating Machinery Association and the Refrigeration Equipment Manufacturers Association.

Any inquiries concerning these data should be addressed to the Bureau of the Census, Industry Division, Metal Products Section, Washington, D. C.

TABLE I—AIR-CONDITIONING EQUIPMENT AND COMPONENTS AND ACCESSORIES FOR AIR-CONDITIONING AND COMMERCIAL REFRIGERATION EQUIPMENT: QUANTITY AND VALUE OF SHIPMENTS, BY CLASS OF PRODUCT, 1946-1950
(Value figures in thousands of dollars)

Class of Product	1950		1949*		1948		1947*		1946	
	Number	Value	Number	Value	Number	Value	Number	Value	Number	Value
Condensing units	858,367	$74,483	610,341	$53,534	841,609	$73,443	1,039,772	$98,296	755,538	$55,379
Ammonia refrigerants	245	352	254	346	1,129	1,799	1,646	2,107	1,409	1,464
Refrigerants except ammonia	858,122	74,131	610,087	53,188	840,480	71,644	973,093	90,224	754,129	53,915
Air-cooled	807,693	57,685	570,280	40,127	797,098	56,829	924,553	73,742	712,781	40,340
Water-cooled	50,429	16,446	39,807	13,061	43,382	14,815	48,540	16,482	41,348	13,575
Condensing units, not reported by type	.....	.....	.....	.....	.....	.....	65,033	5,965	.....	.....
Compressors and compressor units	954,368	46,977	604,431	29,929	459,390	33,493	n. a.	34,586	191,770	15,377
Ammonia refrigerants	2,652	6,756	2,240	5,620	4,156	9,209	4,415	9,481	3,176	5,862
Refrigerants except ammonia	951,716	40,221	602,191	24,309	455,234	24,284	313,682	20,148	188,594	9,515
Compressors and compressor units, not reported by type	.....	.....	.....	.....	.....	.....	n. a.	4,957	.....	.....
Centrifugal refrigeration systems	382	12,249	285	8,189	361	10,351	313	7,814	312	6,593
Heat-exchanger equipment	.....	62,008	.....	40,925	.....	48,552	.....	63,025	.....	40,451
Evaporative condensers	7,818	8,869	4,798	5,850	5,560	7,505	n. a.	7,875	4,859	4,957
Unit Coolers	152,996	26,223	95,850	15,707	102,825	17,874	n. a.	20,167	190,552	18,203
Air-conditioning	49,400	13,306	30,044	7,997	21,633	8,276	n. a.	6,208	9,551	3,880
Refrigeration	103,596	12,917	65,806	7,710	81,192	9,598	n. a.	13,959	181,001	14,323
Other heat-exchanger equipment	.....	26,916	.....	19,368	.....	23,173	.....	28,246	.....	17,291
Heat-exchanger equipment, not reported by type	.....	.....	.....	.....	.....	.....	.....	6,737	.....	.....
Self-contained air-conditioning units	249,854	84,842	123,709	50,584	111,620	49,008	74,976	39,509	47,664	19,500
Room-type	193,807	33,958	89,320	17,940	73,638	15,503	42,904	9,930	29,835	5,870
Other than room-type	56,047	50,884	34,389	32,644	37,982	33,505	32,072	29,579	17,829	13,630
Ice-making machines	11,846	7,203	6,902	4,641	5,947	5,266	7,822	3,122	n. a.	n. a.

*Revised.
n. a. Not available.

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J. P. Carlisle Co.
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Western Ice Equipment Co.
420 Market Street
San Francisco 11, Calif.

JOS. A. MARTOCELLO & COMPANY
229-231 North 13th St., Philadelphia 7, Pa.

ACRMA Annual Meeting Elects Officers

THE Air Conditioning and Refrigerating Machinery Association at a three day meeting held at Hot Springs, Va., elected as its new president Fred W. Smith, president of the Baker Refrigeration Corporation of South Windham, Maine. Widely known for his activity in industry affairs for the past 25 years, Mr. Smith was formerly associated with Carrier Corporation and the Frigidaire Division of General Motors Corporation. During World War II he headed the Special Equipment Branch of the War Production Board.

Fred W. Smith

Elected as vice-presidents were C. S. Stackpole, vice-president and general sales manager of Airtemp Division, Chrysler Corporation, Dayton, Ohio, and H. B. Donley, manager of marketing, General Electric Company, Bloomfield, N. J. G. A. Heuser, president, Henry Vogt Machine Company, Louisville, Ky., was reelected Treasurer.

In addition to the officers, the following were elected to the Board of Directors: W. H. Aubrey, Frick Company, Inc.; A. J. DeFino, Fedders-Quigan Corp.; Maynard Ford, Parks-Cramer Co.; B. W. Hanson, Schaefer, Inc.; George S. Jones, Jr., Servel, Inc.; S. E. Lauer, York Corp.; M. M. Lawler, Worthington Pump & Machinery Corp.; H. F. Lehman, Frigidaire Division, General Motors Corp.; A. B. Newton, Acme Industries, Inc.; A. P. Shanklin, Carrier Corp.; T. E. Smith, Westinghouse Electric Corp.; A. O. Vogel, Vilter Manufacturing Co.; G. E. Wallis, Creamery Package Manufacturing Co.

Featured speakers at the annual meeting were R. A. Whitney, president of the National Sales Executives, A. Gordon Wooton and Sterling Smith of the National Production Authority, and D. H. Reynolds of the Machinery and Allied Products Institute.

Sales and Reorganizations

Huntsville, Ala.—The Mason Brown Ice Company has been sold to the Huntsville Ice and Coal Co. The company will continue to operate through the season as a separate establishment and probably will be disposed of in the fall.

Mankato, Kans.—Glenn Snyder is now operating Glenn's Ice Service in the former location of Gunlick's Ice House.

Rochester, N. Y.—Edward J. Welkley has acquired a controlling interest in the Wolcott Storage & Ice Company and has taken over the property. Floyd Palmer will continue as manager. Extensive improvements and expansion will be made, according to Mr. Welkley.

Utica, N. Y.—The Utica City Ice Corp. has sold the Whitlac Inc., property acquired about twelve years ago, to Morton and Louis Kowalsky, Marris G., Norman and David H. Nathan, all of Utica. The consideration was $35,000. The sale was subject to the condition that the buyers will not permit the premises to be used for five years for the manufacturing, harvesting or sale of ice.

Astoria, Ore—The cold storage facilities, dock and filleting line of the Paragon Packing Company plant here has been sold to the Oregon Fur Producers Association, a newly-formed mink producers' cooperative. The cooperative will operate the cold storage plant to freeze fishscraps for mink feed to supply association members. Although the purchase price was not disclosed, it was understood to be $100,000 or more.

Philadelphia, Pa.—Buildings of the American Ice Co. plant at 6025 Belfield Ave., Germantown, have been sold through the Jackson-Cross Co. to Harry Peters, it was announced recently.

Fires and Accidents

Hillsboro, Ill.—Following a heavy rainfall the plant of the St. Clair Ice & Fuel Company was damaged. The compressors were under water and it was expected that a considerable quantity of ice in the storage rooms would be lost.

Covington, Ky.—Considerable damage was done to the plant of the Blue Grass Provision Co., meat packers, 309 West Twelfth Street by fire which broke out in the smoking rooms. Most of the flames were caused by accumulated grease in the air ducts, it was reported.

Somerville, Mass.—The Bushway Ice Cream Company at 539 Windsor St., was destroyed by fire. Cause of the fire was undetermined but believed to have started in a storage room.

New Incorporation

Utica, N. Y.—Articles were filed with the office of the secretary of state, Albany, June 11, 1951 for a change in name to Utica City Ice Corporation. Attorneys for the company were Ferris, Hughes, Dorrance & Groben, Utica.

What's Wrong With Warehousing

(Continued from page 44)

man may get away with slurring some or all of the above services mentioned and does not have to care too much about customer relations. However, once again harking back to "handling the product as though it was your own," we think that this should be taken literally with regard to the above mentioned services as well as any others which may make it a pleasure for a storer to place his merchandise with us and reflect a feeling of mutual satisfaction for a job well done—a feeling far beyond anything money could pay for. We have elected warehousing as our profession—let's make a good job of it!

Dehydrated Vegetables

(Continued from page 48)

9 fold by a temperature rise of 10 degrees C. or 18 F.

Moisture reduction was also found to improve markedly the retention of ascorbic acid (vitamin C) during storage of dehydrated vegetables. In addition, destruction of ascorbic acid and of carotene was greatly diminished by sealed packaging in an atmosphere that was free of oxygen.

Tax Amortizations Issued

ADDITIONAL certificates of necessity for accelerated tax amortization on new defense facilities has been issued by the Defense Production Administration to the following:

J. D. Jewell Inc., Gainesville, Ga., engaged in freezing and storage of poultry. Applied for $186,251 of which 25 percent was certified.

Merchants Refrigerating Co., New York, N. Y., engaged in refrigerated storage. Amount applied for, $2,000,000, of which 65 percent was certified.

Booth Cold Storage Co., St. Paul, Minn., engaged in military food storage. Amount applied for, $70,800, of which 65 percent was certified.

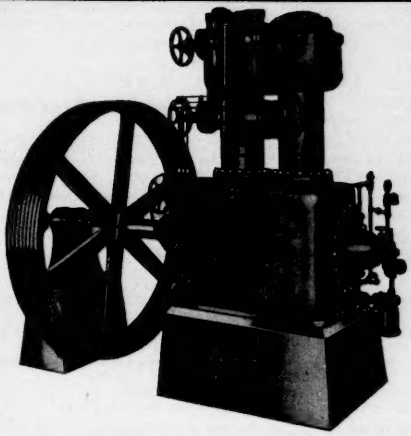
The Winter Garden Freezer Co. Inc., Bells, Tenn. military food processing and freezing. Applied for $140.00, 35 percent certified.

Pure Ice Co., Cameron, La. has been granted tax exemption on new construction valued at $27,686.

New A S R E Chapter

A CHARTER has been granted to the Indianapolis Section of the American Society of Refrigerating Engineers. Wm. E. Spridgeon was elected chairman of the new chapter, the 30th, chartered in the nation.

Sterling



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✔ DEPENDABLE
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✔ EFFICIENT

Check off these points of STERLING superiority, proved by more than fifty years of service to the Refrigeration Industry—they are three of the most important reasons for your new compressor being a STERLING.

In addition to compressors and compressor units the STERLING Line includes such associated equipment as condensers, receivers, pipe coils, brine agitators, ice pumps etc.—all manufactured to the same STERLING STANDARDS.

Contact your nearest STERLING distributor or the factory for complete information.

REYNOLDS MANUFACTURING CO.
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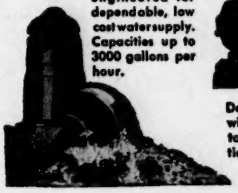
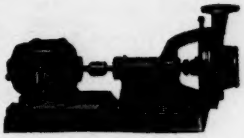
WHEN THE PROBLEM IS

PUMPS

Practically every type and capacity of pump used in your plant is obtainable from one dependable source of supply —YOUR DEMING DISTRIBUTOR. A few examples of the diversified line of standard Deming Pumps are illustrated.

Deming Water Lubricated Deep Well Turbine Pumps are engineered for dependable, low cost water supply. Capacities up to 3000 gallons per hour.





Deming Centrifugal Pumps cover a wide range of types and capacities to give you almost unlimited selection to meet specific requirements.

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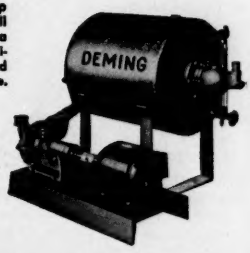

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CONVENTION CALENDAR

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November 6-9, 1951
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November 13-16, 1951
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November 22-24, 1951
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DELTA STATES ICE ASSOCIATION

December 3-5, 1951
Buena Vista Hotel, Biloxi, Miss.
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INDIANA ASSOCIATION OF ICE INDUSTRIES

March 31-April 8, 1952
French Lick Springs Hotel.
ROBT. W. WALTON, Secretary

MISSOURI VALLEY ICE MANUFACTURERS ASSOCIATION

January 7-9, 1952
Hotel President, Kansas City, Mo.
V. A. ESPHORST, Secy.-Treas.

OKLAHOMA ASSOCIATION OF ICE INDUSTRIES

January 20-22, 1952
Burlingame Hotel, Bartlesville, Okla.
HARRY T. HUDSON, Exec. Secy.

MICHIGAN ICE INDUSTRIES ASSOCIATION

February 12-13, 1952
Hotel, Detroit, Mich.
EDWARD W. JACKSON, Secy.

OHIO ASSOCIATION OF ICE INDUSTRIES

February 25-26, 1952
Deshler Wallick, Columbus, Ohio
ELIZABETH SHANNON, Secretary

SOUTHWESTERN ICE MANUFACTURERS' ASS'N., INC.

March 12-14, 1952
Hotel Texas, Fort Worth, Texas
P. A. WEATHERRED, Secy-Counsel

NORTHWEST ASSOCIATION OF ICE INDUSTRIES

March 26-28, 1952
Yakima Hotel, Yakima, Wash.
L. F. MARSH, Secretary

INDIANA ASSOCIATION OF ICE INDUSTRIES

March 31-April 3, 1952
ROBT. W. WALTON, Secretary
French Lick Springs Hotel

Certification Label For Mineral Wool Insulation

THE Industrial Mineral Wool Institute of New York announces the activation July 1 of an industry-wide certification program whereby each carton or section of insulation manufactured by the Institute's member companies will carry a label certifying that its properties exceed minimum requirements prescribed in two commercial standards issued by the National Bureau of Standards (U. S. Department of Commerce). The Institute includes 16 leading manufacturers of mineral wool insulation with plants in all sections of this country and Canada.

In the new program, loose, granulated, felt, blanket, industrial batt, block or board, blanket-type and molded-type pipe insulation and insulating cement are certified under Commercial Standard CS117-49, "Mineral Wool Insulation for Heated Industrial Equipment". Loose, granulated, felt, industrial batt and board or block forms may also be certified under Commercial Standard CS105-48, "Mineral Wool Insulation for Low Temperatures".

Brewery Sold to Food Plant

THE old Sehring Brewery, Joliet, Ill., has been sold to a concern that will engage in food processing for a reported consideration of $187,-500. Kormel Freeman, Chicago attorney, represented the interests acquiring the property.

ASSOCIATION DIRECTORY

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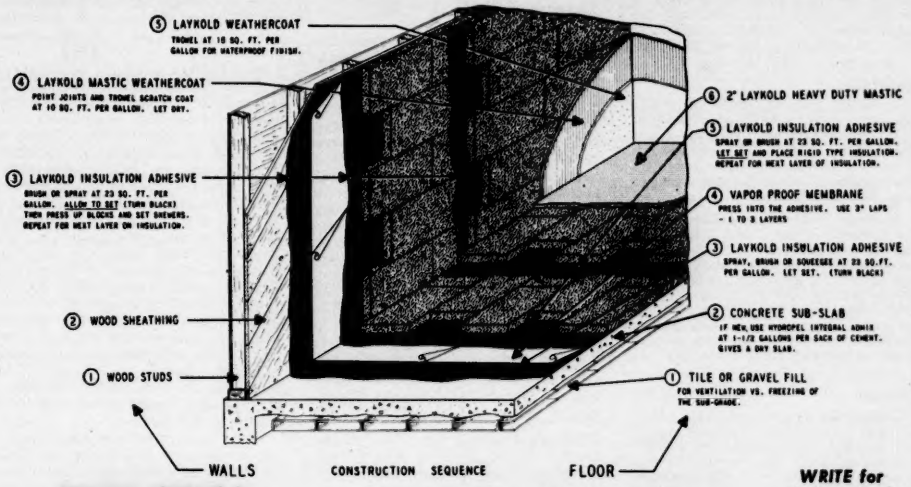
Laykold DATA SHEET No. 2

How to HOLD Insulation on a WOOD WALL and CONCRETE FLOOR


5 LAYKOLD WEATHERCOAT
TROWEL AT 10 SQ. FT. PER GALLON FOR WATERPROOF FINISH.
4 LAYKOLD MASTIC WEATHERCOAT
POINT JOINTS AND TROWEL SCRATCH COAT AT 10 SQ. FT. PER GALLON. LET DRY.
3 LAYKOLD INSULATION ADHESIVE
BRUSH OR SPRAY AT 25 SQ. FT. PER GALLON. ALLOW TO SET (TURN BLACK) THEN PRESS UP BLOCKS AND SET BREWERS. REPEAT FOR NEXT LAYER ON INSULATION.
2 WOOD SHEATHING
1 WOOD STUDS
6 2" LAYKOLD HEAVY DUTY MASTIC
5 LAYKOLD INSULATION ADHESIVE
SPRAY OR BRUSH AT 25 SQ. FT. PER GALLON. LET SET AND PLACE RIGID TYPE INSULATION. REPEAT FOR NEXT LAYER OF INSULATION.
4 VAPOR PROOF MEMBRANE
PRESS INTO THE ADHESIVE. USE 3" LAPS - 1 TO 3 LAYERS
3 LAYKOLD INSULATION ADHESIVE
SPRAY, BRUSH OR SQUEEGEE AT 25 SQ.FT. PER GALLON. LET SET. (TURN BLACK)
2 CONCRETE SUB-SLAB
IF NEW, USE HYDROPEL INTEGRAL ADMIX AT 1-1/2 GALLONS PER SACK OF CEMENT. GIVES A DRY SLAB.
1 TILE OR GRAVEL FILL
FOR VENTILATION VS. FREEZING OF THE SUB-GRADE.
WALLS
CONSTRUCTION SEQUENCE
FLOOR

In the West **STANCAL ASPHALT & BITUMULS COMPANY**
200 BUSH STREET • SAN FRANCISCO 4, CALIF.
Los Angeles, Calif. • Oakland 1, Calif.
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**Stainless Steel Crusher Housing (Optional)*

"Complete line of Tools and Supplies for the Ice Industry"

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–When Sized by a Lilly ICIZER

Lilly ICIZER—Model 14CE8
Cap.: 12-15 tons per hr.
Other Models for all Size Plants

Ice—*properly sized*—brings premium prices—more dollar profit. It brings additional sales and profits the year 'round. The new engineering features in Lilly ICIZERS and CRUSHERS—*Stainless Steel Breaker Housing (Optional), reduced drum speed, etc.*,—give you even more economical and better controlled production.

Write *today* for complete information and prices on—

Lilly ICIZERS and CRUSHERS

Ask for Catalog No. 302

New Plants and Improvements

California

Modesto, Calif.—Certificate of necessity has been granted by OPA to Modesto Refrigerating Company for construction of a $339,658 addition to serve as expanded defense facilities.

Colorado

Alamosa, Colo.—The Valley Ice Company with its new facilities again ices bunker cars of the D and RG Railroad here. Since the destruction of the old ice house by fire a year ago, the icing of potato and other cars has been done at Pueblo.

Alamosa, Colo.—Leonard Anderson has opened the San Luis Valley Packing Plant to process all kinds of meat for Alamosa. The new packing plant has received a monthly quota of 90,000 pounds of beef from the government. The plant has extensive storage capacity and is negotiating with the turkey co-ops for dressing turkeys in quantities this season.

Georgia

Gainesville, Ga.—J. D. Jewel, Inc., engaged in freezing and storage of poultry, has been granted a certificate of necessity for accelerated tax amortization issued by the Defense Production Administration. Amount applied for was $186,251, of which 25 percent was certified.

Minnesota

St. Paul, Minn.—Booth Cold Storage Company, engaged in military food storage, has applied for $70,800 certificate of necessity, of which 65 percent has been certified by the Defense Production Administration.

New York

New York, N. Y.—The Merchants Refrigerating Company, engaged in refrigerated storage, has been issued a certificate of necessity by the Defense Production Administration. Amount applied for was $2,000,000 of which 65 percent was certified.

Niagara Falls, N. Y.—Power City Ice Co., Inc., 918 Niagara Street, recently installed a new automatic pump water softener and purifier to free water from chlorine and harmful ingredients in its ice manufacturing process.

Oklahoma

Madill, Okla. — Frank Partridge, construction superintendent for the Oklahoma Gas and Electric Company, states that the ice machinery in the new plant being built here is now ready for installation.

Icy Item

Russell, Kans.—Foreclosure proceedings have been filed in County District Court against Russell Ice & Locker Company by the Sedalia Ice & Cold Storage Company of Sedalia, Mo. and the Capital Products Company of Jefferson City, Mo. to collect a debt of $11,250.00.

DEATHS

Stanley Baker

THE death of Stanley Baker, pioneer ice man of British Columbia and owner of the Victoria Ice Co. occurred suddenly in his home in Victoria April 6 at the age of 75. In the early horse and buggy days, Mr. Baker harvested and stored natural ice at Swan Lake for distribution to stores and homes. He was actively in control of the Victoria Ice Company from 1910 until the day of his death. He was also closely associated with the Baker Brick & Tile Company in Victoria until 1926 when the company was sold.

Henry L. McCloy

THE death of Henry L. McCloy, president of the Industrial Cold Storage Warehouse Company, Philadelphia, Pa., occurred June 20 at his home in Philadelphia. He was 83 years old. Mr. McCloy was former secretary of the Fidelity Philadelphia Trust Company with whom he had been associated for 58 years before he retired in 1941. He had been treasurer for 26 years of the Philadelphia Rotary Club and was a member of the Union League.

JOHN P. WELSH, chief engineer of the Security Storage Co., Jersey City, N. J., died of a heart ailment May 26 at his home in Jersey City. He was 63 years old. Mr. Welsh, who had been employed by the storage company for 26 years, was a specialist in storage refrigeration. He is survived by his widow, Mrs. Gertrude Welsh, a son, Pvt. John Welsh, Ft. Jackson, S. C. and a daughter, Mrs. Regina Poss, Jersey City.

L. C. MONTGOMERY of Whittier, Calif., former owner of ice plants at Whittier, Fullerton and Anaheim, died May 31 after a short illness. Mr. Montgomery, who was 75 years old, was a native of Stockton, Mo. He was a past president of the Whittier Chamber of Commerce, past president of the Whittier Rotary Club, and member of the Masonic Lodge.

ALGERON J. POLY, chief engineer for the last twenty years of the Union Ice Corp., Erie, Pa., died May 29. He was fifty-four years old. Mr. Poly had been associated with Union Ice for forty years. He was a member of the American Society of Refrigerating Engineers and was a charter member and treasurer of the Erie Section.

William E. Herb

THE death of William E. Herb aged sixty-one, vice-president and general sales manager of Gifford-Wood Co., occurred suddenly Tuesday evening July 3, at the Columbia Memorial Hospital, Hudson, N. Y., following several days illness of a critical heart ailment.

Mr. Herb, a graduate of Lafayette College, joined Gifford-Wood Co., at Hudson, N. Y., in July 1916. After several years of engineering and equipment design he was assigned to the sales departments in New York and Chicago. In 1925 he became district sales manager of the company's Pittsburgh branch office. In February 1927, he returned to G-W's Chicago sales office and remained there until August 1, 1929, when he was appointed sales manager of the Eastern Division with headquarters in the Graybar Building, New York City. On January 1, 1947, he became general sales manager of the company, directing his activities from the main office and factory at Hudson, N. Y. Following his appointment as secretary, he was elected vice-president in March of this year.

Many years of intimate contact with the ice industry brought to Mr. Herb an extensive knowledge of the needs for better equipment to serve the industry in its advancement from use of the natural ice from lakes, rivers and ponds up to the present modern methods of processing and handling manufactured ice. He was a pioneer in the introduction of sized or graded ice for the preservation of food produce. His death is a severe loss to the industry, and a deep personal loss to his many friends to whom he devoted so many years of service.

He is survived by his widow, Mrs. Katherine Herb, two daughters, Mary Elizabeth of Hudson, N. Y., and Mrs. Russell Connington, George's Mills, N. H.

John F. Zilisch

A WELL-KNOWN Mid-West ice man, John F. Zilisch, vice-president of the Wisconsin Ice & Coal Co., Milwaukee, Wisc., died July 19 at Columbia Hospital, Milwaukee. Mr. Zilisch had a wide circle of friends throughout the ice industry. He was 67 years old.

Mr. Zilisch began his business career as an office boy with the Wisconsin Ice & Coal in 1904 and had been vice-president in charge of finances for the last thirty years. He was born in Juneau, Wisc., and had never married. He was a member and past president of the Kiwanis Club, a member and former director of the National Association of Ice Industries and the Wisconsin Association of Ice Industries, a member of the City Club, the Elks Club and the Wholesale and Retail Credit Merchants' Association of Milwaukee. During World War I he was in charge of refrigeration in the mid-west for the Food administration. He is survived by three sisters and a brother.

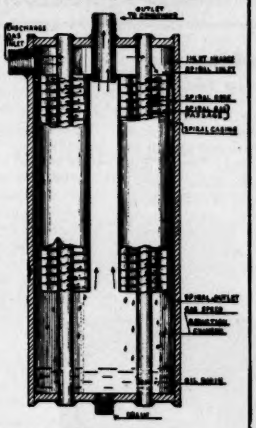
"King Zeero"

OIL SEPARATOR

STOPS OIL FROM ENTERING CONDENSER RECEIVER AND LOW SIDE

Allows operation as was originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

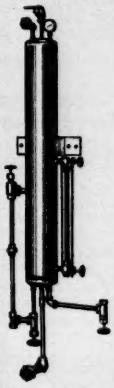
When used in connection with air compressors, water is also separated with the oil.



Built for years of trouble free service. Mechanical details on request.

THE KING ZEERO COMPANY
1447-55 Montrose Ave., Chicago 13, Ill.

Pays for Itself in 6 Months!*



REX
AIR PURGER

Removes Non-Condensible Gases

*Excess head pressure of 10 lbs. in a 25 ton refrigeration plant increases power costs in 6 months, equal to the cost of a Rex Air Purger.

Many plants operate with excess pressure of from 10 to 50 lbs.—a direct result of air in the system. Just think what this means in increased power consumption.

The Rex Air Purger is easy to install. No moving parts. Will last for years. There is a model for every size plant.

Check your system today for excess head pressure—then write us for details on how a Rex Air Purger will cut your power costs.

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CEMCO

Double Gig Ice Hoist
Fast - Sturdy -
Dependable -

Send for details

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THE INDEX LINE
ICE DEALERS SUPPLIES

Only the Highest Quality Merchandise and efficient service necessary for the proper and profitable operation of your business. Write for our 1951 catalog.

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QUALITY COILS FOR ALL APPLICATIONS

WELDED HEADERS, PIPE BENDS AND AMMONIA RECEIVERS

Whether your next job be for a single bend, or coil or complete piping system, Chicago Nipple can supply you: requirements. Experienced workmen, practical engineers, and modern equipment reflect the quality of our products.

Coils are of selected ammonia pipe—all joints are electrically welded—checked under water with an air pressure of 300 pounds to guarantee tightness.

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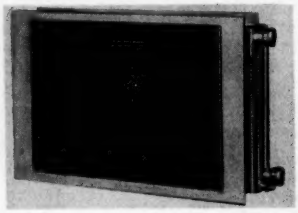
1997 Clybourn Ave., Chicago 14, Ill.

What's New

MACHINERY
APPLIANCES • PROCESSES

New Heating Coils For Air Conditioning

A NEW line of steam heating coils for use in combination with air conditioning coils or as tempering and booster units in long heating ducts is announced by the Rempe Co., Chicago, Ill. They are available



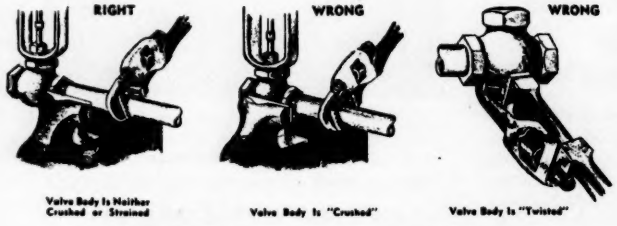
New Rempe Heating Coil

in both single and double row design. The single row are ideal for booster and tempering service and the double row for heavy duty or mixed air heating service. Capacities of the new coils, it is explained, range from 60,000 to 775,000 Btu per hour.

The units are constructed with heavy gauge steel casings, copper tubes and headers, 7 aluminum fins per inch. All fins are collared to tubes. Coils are tested 350 lbs. air pressure for steam working pressures up to 125 lbs.

Tips on Valve Piping

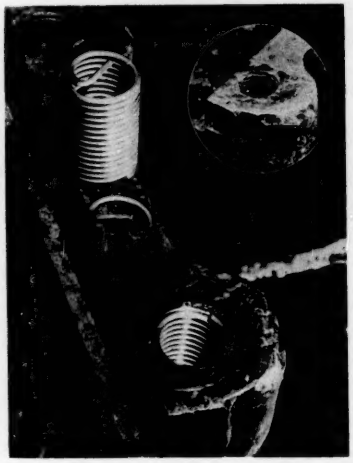
A USEFUL sheet on valve piping has been issued by the Barber-Colman Company, Rockford, Ill. The sheet illustrates hint for filters and plumbers. The illustration below shows the right versus two wrong ways of handling a valve connection.



Three illustrations from sheet on valve piping

Helical Inserts Speed Thread Repair in Motors

STAINLESS steel helical-wire thread inserts are speeding thread-repair operations on heavy electric motor castings at a large eastern repair shop. New threads, stronger and more wear-resistant than original threads, are installed in 80 per cent less time than conventional repair methods require. Cost savings are said to be as high as 60 per cent.



Details of installing Heli-coil wire thread inserts on electric motor casting, showing unmounted thread inserts at top left and installed insert at the bottom. Insert at top right shows damaged thread before repair.

In comparison with three other thread-repair operations previously tried at that shop, the oversize-thread method, the build-up by weld method, and the solid-bushing method, the wire-insert method of thread repair has proved to be the most efficient in its consumption of time, labor and materials, and the most effective in producing a permanently-repaired thread.

New threads are installed by: (a) drilling out the old 1½-6 threads shown in the inset, top left; (b) retapping with 1½-6 Heli-Coil taps; and (c) installing a 1½-6 stainless steel Heli-Coil thread insert with an inserting tool to bring the hole back to original threaded size. These thread liners resist abrasion and eliminate seizing, galling and corrosion.

The unmounted thread insert, top left, with a free diameter slightly larger than the receiving hole, is self-locking when positioned in the hole, yet may be removed with another tool. The installed insert, bottom center, is properly positioned below the casting surface and has had its notched inserting tang removed with a tang break-off tool.

Heli-Coil thread inserts are manufactured by the Heli-Coil Corp., Long Island City 1, New York.

New Device Keeps Cooler Doors Tightly Closed

THE Schoelkopf Manufacturing Co., Madison, Wisconsin, manufacturers of the Air-Lec Automatic Door Operator, is now in full production on the Air Seal, a device designed to prevent cold loss by keeping cooler doors closed tightly. The Air-Lec and Air-Seal operate together from the same source of air pressure, and are controlled by either a mechanical trip or an electrical (low voltage) switch. The mechanical trip is designed for one or two stations near the door; for more and distant stations, the electrical switch is recommended.

At the touch of the switch, the Air-Lec opens the heaviest cooler doors

DIMCO CAST ALUMINUM FIN EVAPORATING COIL

★ *Saves Space*

★ *Saves Weight*

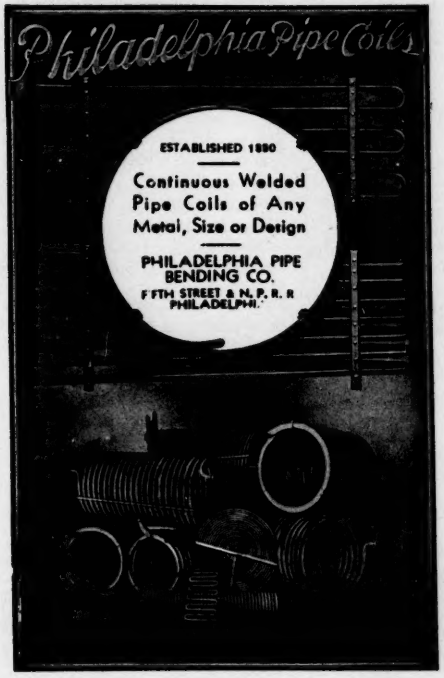
★ *Saves Cost*

CAN BE USED WITH ANY REFRIGERANT
SALES AGENCIES SOLICITED

Manufactured by

DETROIT ICE MACHINE COMPANY
2615 Twelfth St., Detroit 16, Mich.

DIMCO Fin Coils solve low headroom problem
View of Mezzanine Lard Storage Room
Peters Sausage Company, Detroit, Mich.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ESTABLISHED 1890
Continuous Welded Pipe Coils of Any Metal, Size or Design
PHILADELPHIA PIPE BENDING CO.
FIFTH STREET & N. P. R. R
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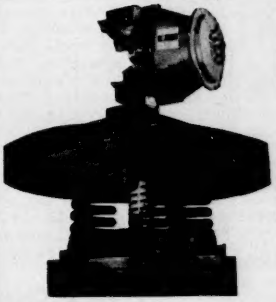

DON'T LOOSE YOUR HEAD!

Use— Safety Head Control

No Compressor Destroys Itself Without First Raising It's Own Head

The Automatic Safety Head Control may be applied to any vertical refrigeration compressor that has a safety head. The Safety Control is operated by the lifting of the safety head as a result of broken valve or screw, carbon build-up, loose connecting rod, or a slug of liquid.

As the safety head lifts, a stainless steel push rod operates a micro-switch which may be connected to the main power control and also through the liquid line solenoid and an alarm system.

Compressors with Safety Head Controls installed are protected against blown out heads. Packing around the push rod is special high temperature and high pressure V-type.

Representatives Wanted

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3759 S. Damen Ave. Chicago 9, Illinois

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automatically, and the Air Seal instantly releases its pressure against the door's edge. When the switch, or trip is again activated, the Air-Lec closes the door, and the Air Seal crowds the edge to hold it closed.

MANUFACTURERS' NEWS

Freon Turbo Glycol Brine System Used in Brewery

THE world's newest and most modern brewery, the $20,000,000 Anheuser-Busch plant erected in Newark, N. J., employs Freon turbo glycol brine cooling systems with glycol used as the coolant throughout the brewery.

Preliminary plans contemplated the use of Freon turbo systems to condense ammonia that would be circulated to the large cellars for direct expansion and for the cooling of the heat exchangers that would, in turn, cool propylene glycol for the attemperator rings and wort coolers.

The system consists of two 710 hp steam turbine driven and one 800 hp synchronous motor driven York Freon-114 turbo glycol brine cooling systems. Other equipment for the brewery includes 28 York air conditioners, 22 units of which are in the cellars building, six units in the bottling house and six York finned coil sections for the chip cellar. All the offices will also be air conditioned.

The Anheuser-Busch Newark plant is the company's first brewery beyond the St. Louis city limits.

When in full operation, this plant will produce one million barrels of fully aged beer per year.

Armstrong Announces New Fiberglas Insulation

THE development of a new and improved series of Fiberglas insulation for refrigerated equipment, to be designated as the "500" series, has been announced by the Building Materials Division of the Armstrong Cork Company. Used in the field on a limited experimental basis since late 1949, the new Fiberglas proved to have a number of important advantages so that it has now been decided to replace the most important of the former "600" series of Fiberglas insulation with the new material.

The new Fiberglas, manufactured by Owens-Corning Fiberglas Corporation, was made possible through the development of improved production equipment so that fiber sizes could be reduced.

Comparing the new series, @ 75 F mean temp., with the former "600" series, PF-511 (2#/c.f.) has a K factor of .250 while the former PF-611 (2#/c.f.) K factor was .260; PF-512 (2½#/c.f.) has a K factor of .240 while PF-612 (2½#/c.f.) had a K factor of .250; PF-513 (3-¾#/c.f.) has a K factor of .225 while PF-613 (3¼#/c.f.) had a K factor of .240.

Remaining in the line in the "600" series will be 614, 615, and 617 which are primarily used for sound deadening and load bearing.

Roots-Connersville Expands Facilities

INVESTMENT of a million and a half dollars in a construction program covering new erection floor, expansion of present test facilities, manufacturing space, and machine tools by Roots-Connersville Blower Corp, Connersville, Ind., is announced by John B. O'Connor, Executive Vice-President of Dresser Industries, Inc., Dallas, Texas, and Robert Owens, President of Roots-Connersville, one of ten Dresser operating companies. These new facilities will enable the Company to test the largest centrifugal blowers and compressers ever designed, which it is now building.

Roots-Connersville has specialized in the design and construction of industrial and specialized blowers for more than a hundred years, and is now in the process of completing a large contract covering a ten-unit order of centrifugal compressors requiring 53,000 horsepower.

Riedel Chief Engineer of Baker Refrigeration

ANNOUNCEMENT of the appointment of Fred Riedel as chief engineer of the Baker Refrigeration Corporation, South Windham, Me., has been made by Frederick W. Smith, Baker President. In this capacity, Mr. Riedel will have complete charge of all design, development and research engineering for Baker Air Conditioning and Refrigeration equipment.

Fred Riedel

Mr. Riedel received his technical education at Hochere Maschinenbauschule, Esslingen, Germany. Before coming to the United States in 1927, he spent five years as a heating and ventilating engineer in Stuttgart, Germany. His first assignment in the USA was a design engineer for the York Heating & Ventilating Co., then joined the Carrier Corporation. From 1935 to 1937 he was connected with the Houde Engineering Corporaton of Buffalo in an engineering capacity.

He later became chief engineer of the Air Conditioning and Refrigeration Division of Worthington Pump and Machinery Corporation. He is a member of ASRE and NAPRE and has served on various technical engineering committees for both associations. He is also a registered professional engineer in the State of Massachusetts.

At Baker he will work on improvements in the present line of equipment and a long range program of new compressor design and production is being inaugurated.

Fitch Joins Sturdy Built

THE appointment of Gordon Fitch as West Coast representative has been announced by The F. B. Dickinson Company of Des Moines, Iowa, makers of Sturdy Built ice vending stations and equipment. Mr. Fitch is well known throughout the ice industry and for many years was a sales representative of the Ward Refrigerator and Manufacturing Co. of Los Angeles. In his new position he will represent the Dickinson Company in the Western territory.

New Frick Distributor

ANNOUNCEMENT is made by Frick Company of Waynesboro, Pa., that the Wittemann Company, Inc., of 242-52 Elk Street, Buffalo, N. Y. has been appointed a distributor for Frick equipment used in collecting, liquefying and storing the carbon dioxide needed in breweries. The Wittemann Company, as is well known, are manufacturers of brewing machinery, especially that employed for collecting gas. They have been in business for over 75 years.

How to HOLD INSULATION on a WOOD WALL and CONCRETE FLOOR

See page 65

NOZZLES • DROP TUBES • CAN DOGS • CAN FILLERS • BLOWERS • BRACKETS • BAGS • HOISTS

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PRINCIPLES OF REFRIGERATION, 3rd Edition (1947) revised by Wm. H. Motz, provides information and data for the practicing refrigeration engineer. Of special interest to erecting and operating refrigerating engineers, refrigeration machinery sales engineers, persons employed in building refrigerating machinery and those employed in ice making, cold storage plants or other establishments equipped with refrigerating machinery. Contains information that the refrigerating engineer should know in order that he may have complete and up-to-date knowledge.

Written in every day language and as free as possible from higher mathematics. The theoretical and fundamental operating principles are given attention first—followed by numerous practical considerations and the application of principles to the economic production of ice and refrigeration for various purposes.

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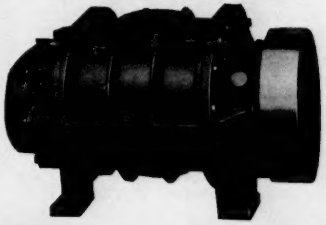

ROOTS-CONNERSVILLE
BLOWER Builders Since 1854
ONE OF THE DRESSER INDUSTRIES

Hansen Joins Acme

THE appointment of Robert T. Hansen as regional sales manager has been announced by Acme Industries Inc. Jackson, Mich. Mr. Hansen will be located in Chicago and will cover the central states area, contacting Acme representatives and other sales outlets for all Acme products. He brings with him a background covering many years in the industry having broad engineering and sales experiences in all phases of heating, ventilating, refrigeration and air conditioning. He has represented Fairbanks, Morse & Co. in Chicago; Chrysler Airtemp Sales Corp. in Detroit and Chicago. In addition he has had several years of actual experience in the contracting business in Chicago. He is well-known by architects, engineers, contractors and industrials in the Mid-Western area because of his previous activities in that area.

Robert T. Hansen

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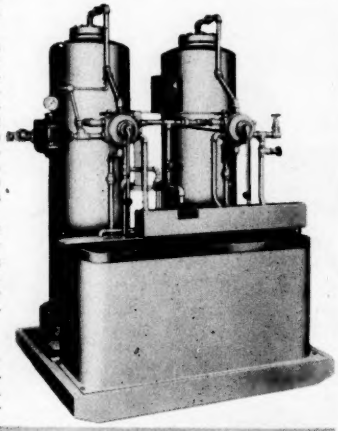
If you will send us an analysis of the water you are using, the quantity you need, and at what rate (gallons per hour) we will send you information on INDUSTRIAL demineralizers, estimate of costs, performance data, etc. Better do it now.



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CATALOGS and BULLETINS

New Conveyco Catalog

FOURTEEN illustrated pages devoted to ice crushing, ice blowing, and ice conveying systems are offered in The Conveyor Company's new catalog V-51D just off the press. Specialized equipment for fresh vegetable growers, packers and shippers is included. New fields of profit are being opened for ice manufacturers in the specialized packing of fresh produce for shipment to distant markets. Equipment for supplying this market is offered in the Conveyco catalog. A copy is available from The Conveyor Co., 3260 East Slauson Avenue, Los Angeles 58, Calif.

Demineralizer Catalog

A NEW four-page catalog giving detailed information with principal specifications and performance data on their standard demineralizer units for low-cost, chemically pure water has been issued by the Industrial Filter & Pump Manufacturing Co. Besides a general description of the construction, installation, and operation of industrial demineralizers, this catalog explains the principle of demineralizers, gives suggestions for their use and application for various manufacturing and chemical processes. A copy is available from the manufacturer.

Quick Freezing Equipment

QUICK freezing with very cold air is described and illustrated in an "Ice and Frost" bulletin issued by The Frick Co., Waynesborro, Pa. In Addition to a general discussion of the subject, it covers blizzard unit freezers, open-tunnel freezers, conveyor truck freezers, track-tunnel freezers, conveyor - tunnel freezers, and special freezers.

How to HOLD INSULATION on a WOOD WALL and CONCRETE FLOOR

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THE BUYERS DIRECTORY

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Vogt Machine Co., Henry, Louisville, Ky.

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Martocello & Co., Jos. A., Philadelphia, Pa.

AIR COMPRESSORS
Frick Co., Waynesboro, Pa.

AIR CONDITIONING EQUIPMENT
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Niagara Blower Co., New York, N.Y.

AMMONIA COMPRESSOR VALVES
Frick Co., Waynesboro, Pa.

AMMONIA COMPRESSORS
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA CONTROL DEVICES
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.

AMMONIA FLOAT VALVES
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesvoro, Pa.
Phillips & Co., H. A., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA MANUFACTURERS
Armour Ammonia Div., Armour & Co., Chicago, Ill.
Barrett Div., The, Allied Chemical & Dye Corp., New York, N. Y.
Bower Chemical Mfg. Co., Henry, Philadelphia, Pa.
du Pont, Polychemicals Dept., Wilmington, Delaware

AMMONIA MASKS
Acme Protection Equipment Co., Chicago, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.

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Howe Ice Machine Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

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Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
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Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. F., Ridgefield Park, N. J.
National Pipe Bending Co., New Haven, Conn.
Rempe Company, Chicago, Ill.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

AMMONIA VALVES & FITTINGS
Acme Industries, Inc., Jackson, Mich.
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Shank Co., Cyrus, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

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Greene, Van R. H., New York, N. Y.
Ophuls & Associates, Fred, New York, N. Y.

ASPHALT PRODUCTS
American Bitumuls Co. San Francisco, Calif.

AUTOMATIC CONTROL DEVICES
Alco Valve Co., St. Louis, Mo.
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Phillips & Co., H. A., Chicago, Ill.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.
International Paper Co., New York, N. Y.
Union Bag & Paper Corp., New York, N. Y.
United Ice & Oil Supply Co., Boston, Mass.

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International Paper Co., New York, N. Y.
Union Bag & Paper Co., New York, N. Y.

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Vogt Machine Co., Henry, Louisville, Ky.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

BOILERS
Frick Co., Waynesboro, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

BOILER TUBES
Byers Co., A. M., Pittsburgh, Pa.

BOOKS—TECHNICAL
Nickerson & Collins Co., Chicago, Ill.

BRINE CIRCULATORS
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Martocello & Co., Jos. A., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Roots-Connersville Blower Corp., Connersville, Ky.

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Frick Co., Waynesboro, Pa.
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Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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THE BUYERS

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CAR ICING EQUIPMENT
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Gifford-Wood Co., Hudson, N. Y.
Conveyor Co., The, Los Angeles, Calif.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Tri-Pak Machinery Service Inc., Harlingen, Texas

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Barada & Page, Inc., Kansas City, Mo.

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Acme Industries, Inc., Jackson, Mich.
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Detroit Ice Machine Co., Detroit, Mich.
Howe Ice Machine Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Rempe Company, Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

COLD STORAGE CONSTRUCTION
Armstrong Cork Co., Lancaster, Pa.
Frick Co., Waynesboro, Pa.

COLD STORAGE DOORS
Butcher Boy Cold Storage Door Co., Chicago, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jamison Cold Stge. Door Co., Hagerstown, Md.
Refrigeration Engineering Co., Montgomery, Minn.

COMPRESSORS
(See Ice Making and Refrigerating Machinery)

CONDENSERS
Acme Industries, Inc., Jackson, Mich.
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Frick Co., Waynesboro, Pa.
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King-Zeero Co., Chicago, Ill.
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Philadelphia Pipe Bending Co., Philadelphia, Pa.
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Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.

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CORROSION CONTROL
Wright Chemical Control Corp., Chicago, Ill.

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Vivian Mfg. Co., St. Louis, Mo.

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Armstrong Cork Co., Lancaster, Pa.

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Vogt Machine Co., Henry, Louisville, Ky.

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Niagara Blower Co., New York, N.Y.
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Vogt Machine Co., Henry, Louisville, Ky.

FIBERGLAS
Armstrong Cork Co., Lancaster, Pa.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Industrial Filter & Pump Mfg. Co., Inc., Chicago, Ill.
Martocello & Co., Jos. A., Philadelphia, Pa.

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FIRST AID SUPPLIES
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FOOD FREEZING EQUIPMENT
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Link-Belt Co., Chicago, Ill.
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United Ice & Oil Supply Co., Boston, Mass.
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Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jamison Cold Storage Door Co., Hagerstown, Md.
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Martocello & Co., Jos. A., Philadelphia, Pa.

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Gifford-Wood Co., Hudson, N. Y.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Refrigeration Engineering Co., Montgomery, Minn.
United Ice & Oil Supply Co., Boston, Mass.

ICE CREAM PLANTS
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Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Lilly Co., The, Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
Martocello & Co., Jos. A., Philadelphia, Pa.
Tri-Pak Machinery Service Inc. Harlingen, Texas
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Detroit Ice Machine Co., Detroit, Mich.
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Frick Company, Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Ice Plant Equipment Co., Inc. Philadelphia, Pa.
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Vogt Machine Co., Henry, Louisville, Ky.

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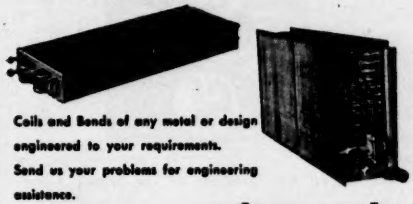

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ICE PICK VENDING MACHINES
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INSULATION ADHESIVES
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Acme Protection Equipment Co., Chicago, Ill.

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Texas Co., The, New York, N. Y.

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Rex Engineering & Sales Co., Oklahoma City, Okla.

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Roots-Connersville Blower Corp., Connersville, Ind.

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PROTECTIVE DEVICES
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Aurora Pump Co., Aurora, Ill.
Deming Co., The, Salem, Ohio
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Layne & Bowler, Inc., Memphis, Tenn.
Roots-Connersville Blower Corp., Connersville, Ind.

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Roots-Connersville Blower Corp., Connersville, Ind.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

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Vogt Machine Co., Henry, Louisville, Ky.

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Refrigeration Engineering Co., Montgomery, Minn.
S & S Vending Machine Co., San Jose, Calif.

REFRIGERATING AND ICE MAKING MACHINERY
(See Ice Making and Refrigerating Machinery)

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Wright Chemical Corp., Chicago, Ill.

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Safety Head Control Co., Chicago, Ill.

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Gifford-Wood Co., Hudson, N. Y.
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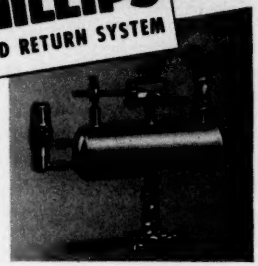

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	Item No.
1—4x4 York, 300 RPM	16
6—6x6 York's, 200 RPM	20
1—6x6 Frick, 257 RPM	21
2—6x6 York's, 400 RPM, forced-feed lubrication	25
2—6½x6½ Arctics, 350 RPM, forced feed lub.	30
1—7¼x7¼ Baker, 350 RPM, forced feed lubrication	35
1—7x7 Frick, 200 RPM	40
1—7½x7½ York, 200 RPM	51
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1—10x10 Carbondale, 100 HP synch. motor, 350 RPM	81
3—10x10 York's, 225 RPM, semi-forced feed lub.	82
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1—10x10 York, direct connected 100 HP Sync. Motor	86
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2—12x12 Frick, direct conn. 150 HP synch. motor	98

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	Item No.
1—8x8 York—Direct connected to 50 HP Fairbanks-Morse at 257 RPM	210

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1—5x5 Frick—Forced Feed—400 RPM Latest Type	758

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1—300 lb. ULINE, fully automatic cuber	501
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2—180 h.p.—68-CP 600 r.p.m. Chicago Pneumatic Tool Co. 6 cylinder Diesel engines, (220 h.p. at 720 r.p.m.)
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1—8x8 Frick
1—7½x7½ York with 40 h.p. motor
2—6½x6½ Yorks
1—6½x6½ Baker
1—6x6 Frick
1—5x5 York self-contained unit
1—4x4 York self-contained unit.
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Motors and starters for all compressors. Condensers, brine coolers, cranes, can dumps, can fillers, etc. Send us your requirements on any equipment you may need.

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A Complete 480 ton REFRIGERATION UNIT consisting of:

2—DeLaVergne horizontal duples 12x15 ammonia compressors—each directly connected to a 250 h.p. G.E. synchronous 3/60/550/200 r.p.m. motor; complete with multi-pass ammonia condenser, four Frick Zig-Zag water coolers, brine coolers, pumps, interconnecting piping, etc., etc.
Will sell as two separate units. UNITS SET UP EXACTLY AS OPERATED, available for immediate delivery.
Also Carrier and Sturtevant AIR CONDITIONING UNITS ranging from 5000 to 70,000 CFM, complete with fans, pumps, motors, records, and automatic controls.

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FOR SALE—USED EQUIPMENT

1—35 ton York low pressure, electric drive, synchronous motor driven, 4 can lift, well pumps vertical shell & tube condenser, piping, panels complete.
3—100 ton York and Frick ice plants.
1—50 ton York ice plant.
1—70 ton Vilter ice plant.
1—200 ton York ice plant.
1—120 ton York ice plant.
1—400 ton York ice plant.
2—300# Champion ice crushers with 7½ h.p. motors, with hoppers and chutes.
1—Model F Gifford-Wood 2 way scoring machine.
1—Perfection 2 way scoring machine.
3—Tiering machines, 4-6-8 Tiers.
1—Gifford-Wood Model #560 Ice Crusher, in original crate.
1—90 ton horizontal shell and tube condenser.
500—11"x22"x47" ice cans, good condition.
500—11"x22"x50" ice cans, good condition, LIKE NEW.
1—4x4 York self-contained unit, 5 h.p.
102—Door type Master lockers, 15"x24"x30".
102—Drawer type Master lockers, 16"x24"x30".
1—Model 54-Y Creasey ice crusher, belt drive.
Conveyor chain—6" pitch.
Send us your requirements on equipment you need.

UNITED SUPPLY & EQUIPMENT CO., INC.
55 Beverly Street Boston 14, Mass.

For Sale

3—7¾"x5" Frick Ammonia Booster Compressors with inter coolers and float controls.

1—14"x10" York Booster Compressor—'V' belt drive.

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Box MY 14
Ice and Refrigeration
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FOR SALE—Evaporator coil—50 ton new, built by Crane Co. Flooded type; immediate delivery. Write for description or photo and measurements; also compressors 2x2 to 8x8; valves, all types, cork insulation, board and granulated. Electrical Repair Co., 210 Prescott St., St. Paul 7, Minn.

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Frick 30"x16'-0", 100-ton, 80 tube vertical single pass condenser. Excellent condition, $450.00. Frick 9x9 compressor, forced feed, 190 r.p.m., good condition. Good ammonia valves, both screw and flange types, ½" to 6", at bargains. Lots of other good equipment. Tell us what you need.

AAA STEEL & SUPPLY CO.
Canton & Hawkins Sts. Dallas 1, Texas

FOR SALE—ICE PLANTS & EQUIPMENT

Ice Cans—11x22x47—Good Condition.
Ice Cans—11x22x51—Excellent Condition.
50-50-60 Ton Ice Plants—Immediate Sale.
1—60 Ton Capacity Vogt Tube Ice Machine. Complete with Compressors.
1—12"x12" Duplex Frick Ammonia Compressor direct connected to synchronous motor.
1—10"x10" York Ammonia Compressor direct connected to 60 H.P. synchronous motor 200 R.P.M.
1—10"x10" York Ammonia Compressor direct connected to 100 H.P. synchronous motor 200 R.P.M.
1—9"x9" ammonia compressor direct connected to 50 H.P. synchronous motor 200 R.P.M.
1—10"x10" York ammonia compressor 200 R.P.M.
1—8"x8" York ammonia compressor direct connected to 60 H.P. synchronous motor 360 R.P.M.
1—4"x8" York Ammonia Compressor High Speed.
1—5"x5" York Ammonia Compressor High Speed.
Can supply motors for all compressors.
1—6"x6" Voss Ammonia Compressor.
1—4"x4" H.S. Self-contained Unit, York.
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Assorted sizes electric hoists and cranes ranging from 2 to 6 ton capacity.
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2—Sheppard Cranes 4 and 5 ton capacities—3 motor jobs.
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Any Equipment You May Need.

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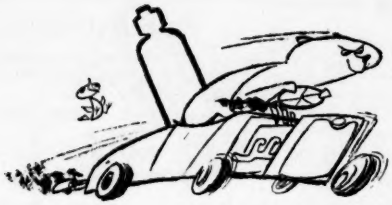

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Armour and Company, 1355 W. 31st St., Chicago 9, Ill.

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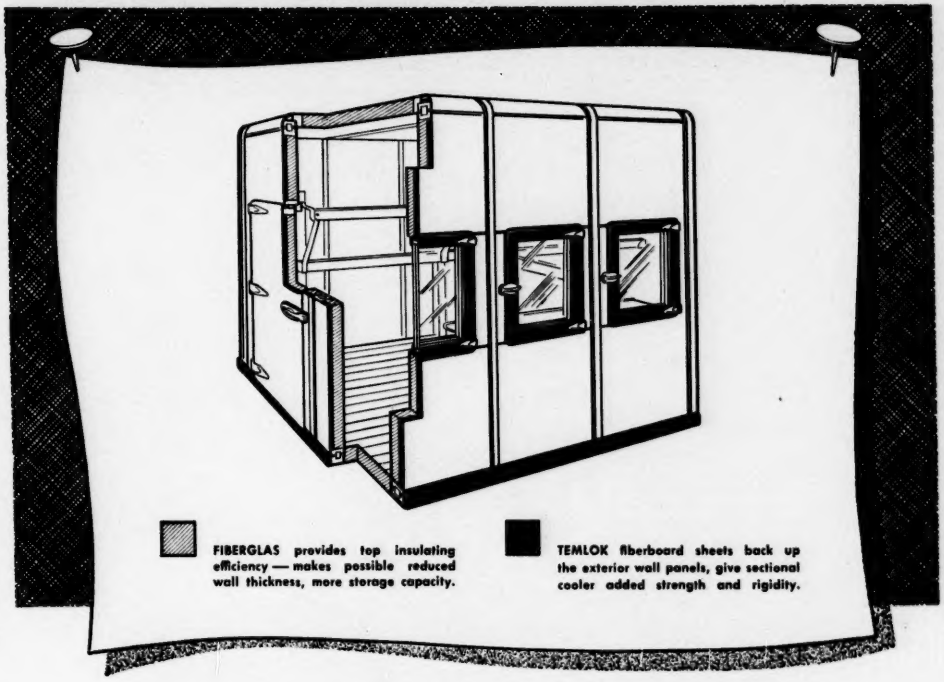

FIBERGLAS provides top insulating efficiency — makes possible reduced wall thickness, more storage capacity.

TEMLOK fiberboard sheets back up the exterior wall panels, give sectional cooler added strength and rigidity.

Which is the best insulation for a sectional walk-in cooler?

With sectional walk-ins, as with most types of refrigerated equipment, there's no single insulating material that can be called the best for all models. Each design dictates which materials will do the most effective job.

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In ceiling, walls, and floor, Fiberglas provides such high insulating efficiency that it is possible to keep wall thickness at a minimum, thereby increasing interior storage capacity. The low cost of Fiberglas, plus its resistance to moisture and imperviousness to rot or decay, makes it a most practical material for coolers of this type.

Strong, rigid Temlok fiberboard is used to back up the large exterior metal sheets. It gives sectional side panels added strength and resistance to indentation and buckling.

Choosing the equipment insulations that give you the best results at lowest cost often turns out to be a difficult job. That's why it's a sound idea to consult someone who can offer you wide experience in the field, plus a complete selection of materials. Armstrong engineers have been advising equipment manufacturers on insulation for many years. They can offer a complete line of materials to solve any design problem. This line consists of LK® Corkboard, Temlok fiberboard insulation, and several types of Fiberglas.

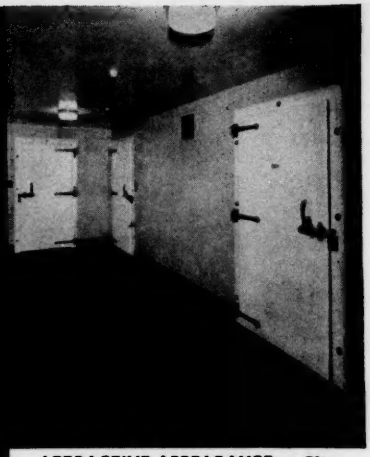
To prove the effectiveness of their recommendations, Armstrong engineers will be glad to test your equipment in Armstrong's Life Test Room. A few weeks here are equal to five years in actual use. There's no charge for this service, and you get a detailed report on your equipment's performance.

For complete information on Armstrong's Equipment Insulations and Life Test Service, call the Armstrong office nearest you or write to Armstrong Cork Co., 4508 Queen St., Lancaster, Pa.

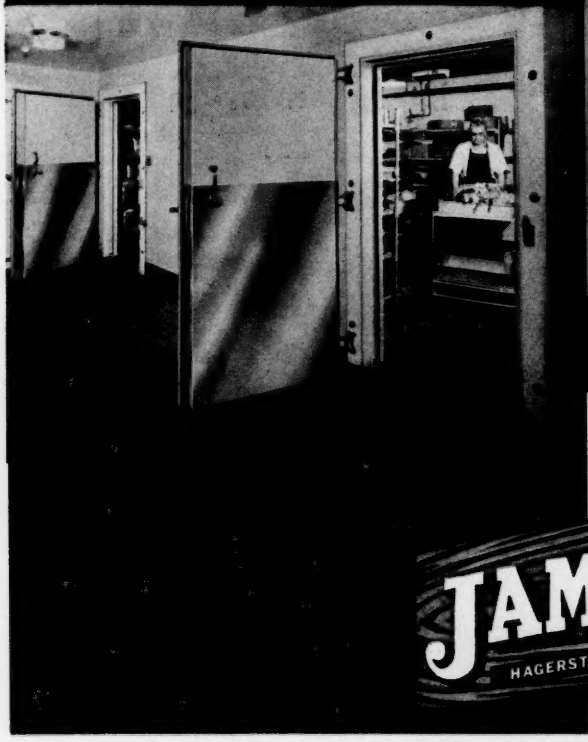
* OCF CORP.

ARMSTRONG'S EQUIPMENT INSULATION

LK CORKBOARD • FIBERGLAS* • TEMLOK



ATTRACTIVE APPEARANCE . . . Glistening white enamel over galvanized metal cladding and chrome hardware. Match harmoniously with the sanitary walls. The three doors above (l. to r.) lead to: cold cuts room; vegetable and fruit room; meat room.



EASILY OPENED . . . The Wedgetight Fastener maintains a tight seal, so that the door can be opened readily from either side with minimum effort.

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